

PROJECT: 48392

REFERENCE: U-6146

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STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

STRUCTURE
SUBSURFACE INVESTIGATION

COUNTY GASTON
PROJECT DESCRIPTION US 29/US74 (WILKINSON BLVD)
FROM SR 2209 (WESLEYAN DR/MARKET ST) TO
SR 2016/SR 2017 (GEORGIA BELLE AVE/HUBBARD ST)
SITE DESCRIPTION REPLACE BRIDGE NO. 82 ON
US 29 /74 OVER SOUTH FORK CATAWBA RIVER

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	U-6146	1	41

CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF STUDY, PLANNING AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. THE VARIOUS FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N.C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT, AT (919) 707-6850. THE SUBSURFACE PLANS AND REPORTS, FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA ARE NOT PART OF THE CONTRACT.

GENERAL SOIL AND ROCK STRATA DESCRIPTIONS AND INDICATED BOUNDARIES ARE BASED ON A GEOTECHNICAL INTERPRETATION OF ALL AVAILABLE SUBSURFACE DATA AND MAY NOT NECESSARILY REFLECT THE ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS OR BETWEEN SAMPLED STRATA WITHIN THE BOREHOLE. THE LABORATORY SAMPLE DATA AND THE IN SITU (IN-PLACE) TEST DATA CAN BE RELIED ON ONLY TO THE DEGREE OF RELIABILITY INHERENT IN THE STANDARD TEST METHOD. THE OBSERVED WATER LEVELS OR SOIL MOISTURE CONDITIONS INDICATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOIL MOISTURE CONDITIONS MAY VARY CONSIDERABLY WITH TIME ACCORDING TO CLIMATIC CONDITIONS INCLUDING TEMPERATURES, PRECIPITATION AND WIND, AS WELL AS OTHER NON-CLIMATIC FACTORS.

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- THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N.C. DEPARTMENT OF TRANSPORTATION AS ACCURATE NOR IS IT CONSIDERED PART OF THE PLANS, SPECIFICATIONS OR CONTRACT FOR THE PROJECT.
 - BY HAVING REQUESTED THIS INFORMATION, THE CONTRACTOR SPECIFICALLY WAIVES ANY CLAIMS FOR INCREASED COMPENSATION OR EXTENSION OF TIME BASED ON DIFFERENCES BETWEEN THE CONDITIONS INDICATED HEREIN AND THE ACTUAL CONDITIONS AT THE PROJECT SITE.

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NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION

SOIL IS CONSIDERED UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO THE STANDARD PENETRATION TEST (AASHTO T 206, ASTM D1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. FOR EXAMPLE, *VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6*

SOIL LEGEND AND AASHTO CLASSIFICATION

GENERAL CLASS.	GRANULAR MATERIALS (≤ 35% PASSING #200)						SILT-CLAY MATERIALS (> 35% PASSING #200)						ORGANIC MATERIALS					
GROUP CLASS.	A-1		A-3		A-2		A-4		A-5		A-6		A-7		A-1, A-2		A-4, A-5	
SYMBOL	A-1-a	A-1-b	A-2-4		A-2-5		A-2-6		A-2-7		A-4		A-5		A-6		A-7	
% PASSING #10 #40 #200	50 MX 30 MX 15 MX	50 MX 25 MX	51 MN	35 MX	35 MX	35 MX	35 MX	36 MN	36 MN	36 MN	36 MN	36 MN	36 MN	36 MN	36 MN	GRANULAR SOILS	SILT-CLAY SOILS	MUCK, PEAT
MATERIAL PASSING #40 LL PI	— 6 MX		— NP		40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	40 MX 10 MX	41 MN 11 MN	40 MX 10 MX	41 MN 11 MN	40 MX 11 MN	41 MN 11 MN	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER	HIGHLY ORGANIC SOILS		
GROUP INDEX	0		0		0		4 MX		8 MX		12 MX		16 MX		NO MX			
USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS. GRAVEL, AND SAND		FINE SAND		SILTY OR CLAYEY GRAVEL AND SAND		SILTY SOILS		CLAYEY SOILS									
GEN. RATING AS SUBGRADE	EXCELLENT TO GOOD						FAIR TO POOR						FAIR TO POOR		POOR		UNSUITABLE	

PI OF A-7-5 SUBGROUP IS ≤ LL - 30; PI OF A-7-6 SUBGROUP IS > LL - 30

CONSISTENCY OR DENSENESS

PRIMARY SOIL TYPE	COMPACTNESS OR CONSISTENCY	RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE)	RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT ²)
GENERALLY GRANULAR MATERIAL (NON-COHESIVE)	VERY LOOSE LOOSE MEDIUM DENSE DENSE VERY DENSE	< 4 4 TO 10 10 TO 30 30 TO 50 > 50	N/A
GENERALLY SILT-CLAY MATERIAL (COHESIVE)	VERY SOFT SOFT MEDIUM STIFF STIFF VERY STIFF HARD	< 2 2 TO 4 4 TO 8 8 TO 15 15 TO 30 > 30	< 0.25 0.25 TO 0.5 0.5 TO 1.0 1 TO 2 2 TO 4 > 4

TEXTURE OR GRAIN SIZE

U.S. STD. SIEVE SIZE OPENING (MM)	4	10	40	60	200	270
	4.75	2.00	0.42	0.25	0.075	0.053
BOULDER (BLDR.)						
COBBLE (COB.)						
GRAVEL (GR.)						
COARSE SAND (CSE. SD.)						
FINE SAND (F SD.)						
SILT (SL.)						
CLAY (CL.)						

GRAIN SIZE: 305 IN. 75 12 3 2.0 0.25 0.05 0.005

SOIL MOISTURE - CORRELATION OF TERMS

SOIL MOISTURE SCALE (ATTERBERG LIMITS)	FIELD MOISTURE DESCRIPTION	GUIDE FOR FIELD MOISTURE DESCRIPTION
LL PLASTIC RANGE (PI) PL	- SATURATED - (SAT.)	USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE
	- WET - (W)	SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE
	- MOIST - (M)	SOLID; AT OR NEAR OPTIMUM MOISTURE
OM SL	- DRY - (D)	REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE

PLASTICITY

	PLASTICITY INDEX (PI)	DRY STRENGTH
NON PLASTIC	0-5	VERY LOW
SLIGHTLY PLASTIC	6-15	SLIGHT
MODERATELY PLASTIC	16-25	MEDIUM
HIGHLY PLASTIC	26 OR MORE	HIGH

COLOR

DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY). MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.

GRADATION

WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE.
UNIFORMLY GRADED - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE.
GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES OF TWO OR MORE SIZES.

ANGULARITY OF GRAINS

THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS:
ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.

MINERALOGICAL COMPOSITION

MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.

COMPRESSIBILITY

SLIGHTLY COMPRESSIBLE LL < 31
MODERATELY COMPRESSIBLE LL = 31 - 50
HIGHLY COMPRESSIBLE LL > 50

PERCENTAGE OF MATERIAL

ORGANIC MATERIAL	GRANULAR SOILS	SILT - CLAY SOILS	OTHER MATERIAL
TRACE OF ORGANIC MATTER	2 - 3%	3 - 5%	TRACE
LITTLE ORGANIC MATTER	3 - 5%	5 - 12%	LITTLE
MODERATELY ORGANIC	5 - 10%	12 - 20%	SOME
HIGHLY ORGANIC	> 10%	> 20%	HIGHLY

GROUND WATER

▽

WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING

▽

STATIC WATER LEVEL AFTER 24 HOURS

▽PW

PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA

○

SPRING OR SEEP

MISCELLANEOUS SYMBOLS

ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION

SOIL SYMBOL

ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT

INFERRED SOIL BOUNDARY

INFERRED ROCK LINE

ALLUVIAL SOIL BOUNDARY

25/025

DIP & DIP DIRECTION OF ROCK STRUCTURES

SPT DMT VST PMT

TEST BORING

AUGER BORING

CORE BORING

MONITORING WELL

PIEZOMETER INSTALLATION

SLOPE INDICATOR INSTALLATION

CONE PENETROMETER TEST

SOUNDING ROD

TEST BORING WITH CORE

SPT N-VALUE

RECOMMENDATION SYMBOLS

UNDERCUT

SHALLOW UNDERCUT

UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE

UNCLASSIFIED EXCAVATION - ACCEPTABLE DEGRADABLE ROCK

UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE USED IN THE TOP 3 FEET OF EMBANKMENT OR BACKFILL

ABBREVIATIONS

AR - AUGER REFUSAL
BT - BORING TERMINATED
CL - CLAY
CPT - CONE PENETRATION TEST
CSE - COARSE
DMT - DILATOMETER TEST
DPT - DYNAMIC PENETRATION TEST
e - VOID RATIO
F - FINE
FOSS - FOSSILIFEROUS
FRAC - FRACTURED, FRACTURES
FRAGS - FRAGMENTS
HL - HIGHLY
MED. - MEDIUM
MICA - MICACEOUS
MOD. - MODERATELY
NP - NON PLASTIC
ORG. - ORGANIC
PMT - PRESSUREMETER TEST
SAP. - SAPROLITIC
SD. - SAND, SANDY
SL. - SILT, SILTY
SLI. - SLIGHTLY
TCR - TRI-CONE REFUSAL
w - MOISTURE CONTENT
V - VERY
VST - VANE SHEAR TEST
WEA. - WEATHERED
% - UNIT WEIGHT
%g - DRY UNIT WEIGHT
SAMPLE ABBREVIATIONS
S - BULK
SS - SPLIT SPOON
ST - SHELBY TUBE
RS - ROCK
RT - RECOMPACTED TRIAXIAL
CBR - CALIFORNIA BEARING RATIO

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:

☐ CME-45C

☐ CME-55

☒ CME-550

☐ VANE SHEAR TEST

☐ PORTABLE HOIST

☒ DIEDRICH D-50

☒ DIEDRICH D-25

ADVANCING TOOLS:

☐ CLAY BITS

☐ 6" CONTINUOUS FLIGHT AUGER

☒ 8" HOLLOW AUGERS

☐ HARD FACED FINGER BITS

☐ TUNG-CARBIDE INSERTS

☒ CASING

☒ W/ ADVANCER

☐ TRICONE

☐ *STEEL TEETH

☐ TRICONE

☐ *TUNG.-CARB.

☒ CORE BIT

☐

HAMMER TYPE:

☒ AUTOMATIC

☐ MANUAL

CORE SIZE:

☐ -B

☐ -H

☒ -N Q2

HAND TOOLS:

☐ POST HOLE DIGGER

☐ HAND AUGER

☐ SOUNDING ROD

☐ VANE SHEAR TEST

☐

ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT REFUSAL IF TESTED. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS IN NON-COASTAL PLAIN MATERIAL. THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK. ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:

WEATHERED ROCK (WR)

CRYSTALLINE ROCK (CR)

NON-CRYSTALLINE ROCK (NCR)

COASTAL PLAIN SEDIMENTARY ROCK (CP)

NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.

FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.

FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.

COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.

WEATHERING

FRESH
VERY SLIGHT (V SL.)
SLIGHT (SL.)
MODERATE (MOD.)
MODERATELY SEVERE (MOD. SEV.)
SEVERE (SEV.)
VERY SEVERE (V SEV.)
COMPLETE

ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE.
ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN. CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE.
ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.
SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK.
ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. *IF TESTED, WOULD YIELD SPT REFUSAL*
ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. *IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF*
ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. *IF TESTED, WOULD YIELD SPT N VALUES < 100 BPF*
ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.

TERMS AND DEFINITIONS

ALLUVIUM (ALLUV.)

AQUIFER

ARENACEOUS

ARGILLACEOUS

ARTESIAN

CALCAREOUS (CALC.)

COLLUVIUM

CORE RECOVERY (REC.)

DIKE

DIP

DIP DIRECTION (DIP AZIMUTH)

FAULT

FISSILE

FLOAT

FLOOD PLAIN (FP)

FORMATION (FM.)

JOINT

LEDGE

LENS

MOTTLED (MOT.)

PERCHED WATER

RESIDUAL (RES.) SOIL

SAPROLITE (SAP.)

SILL

SLICKENSIDE

STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT)

STRATA CORE RECOVERY (SREC.)

STRATA ROCK QUALITY DESIGNATION (SROD)

TOPSOIL (TS.)

SOILS THAT HAVE BEEN TRANSPORTED BY WATER.

A WATER BEARING FORMATION OR STRATA.

APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.

APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, SUCH AS SHALE, SLATE, ETC.

GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE.

SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.

ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.

TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.

A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.

THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.

THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.

A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.

A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.

ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLOOGED FROM PARENT MATERIAL.

LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.

A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.

FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.

A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.

A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.

IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.

WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.

SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.

A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.

RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.

AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.

POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.

NUMBER OF BLOWS (N OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.

TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.

A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.

SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.

BENCH MARK: BM#3: N-551,877.6307, E-1,381,365.7688

ELEVATION: 580.97 FEET

NOTES:
ROADWAY DESIGN AND SURVEY INFORMATION PROVIDED BY TGS ENGINEERS.

DATE: 8-15-14

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

GEOTECHNICAL ENGINEERING UNIT

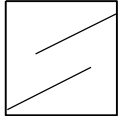
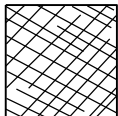
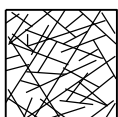
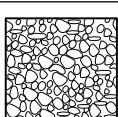
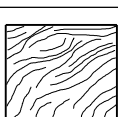
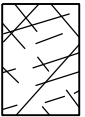
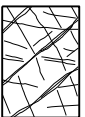
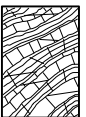
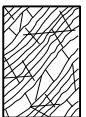
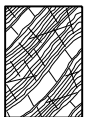
SUBSURFACE INVESTIGATION

SUPPLEMENTAL LEGEND, GEOLOGICAL STRENGTH INDEX (GSI) TABLES

FROM AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS

AASHTO LRFD Figure 10.4.6.4-1 — Determination of GSI for Jointed Rock Mass (Marinos and Hoek, 2000)

AASHTO LRFD Figure 10.4.6.4-2 — Determination of GSI for Tectonically Deformed Heterogeneous Rock Masses (Marinos and Hoek, 2000)

GEOLOGICAL STRENGTH INDEX (GSI) FOR JOINTED ROCKS (Hoek and Marinos, 2000) From the lithology, structure and surface conditions of the discontinuities, estimate the average value of GSI. Do not try to be too precise. Quoting a range from 33 to 37 is more realistic than stating that GSI = 35. Note that the table does not apply to structurally controlled failures. Where weak planar structural planes are present in an unfavorable orientation with respect to the excavation face, these will dominate the rock mass behaviour. The shear strength of surfaces in rocks that are prone to deterioration as a result of changes in moisture content will be reduced if water is present. When working with rocks in the fair to very poor categories, a shift to the right may be made for wet conditions. Water pressure is dealt with by effective stress analysis.	SURFACE CONDITIONS VERY GOOD Very rough, fresh unweathered surfaces GOOD Rough, slightly weathered, iron stained surfaces FAIR Smooth, moderately weathered and altered surfaces POOR Slickensided, highly weathered surfaces with compact coatings or fillings or angular fragments VERY POOR Slickensided, highly weathered surfaces with soft clay coatings or fillings	STRUCTURE INTACT OR MASSIVE - intact rock specimens or massive in situ rock with few widely spaced discontinuities BLOCKY - well interlocked undisturbed rock mass consisting of cubical blocks formed by three intersecting discontinuity sets VERY BLOCKY - interlocked, partially disturbed mass with multi-faceted angular blocks formed by 4 or more joint sets BLOCKY/DISTURBED/SEAMY - folded with angular blocks formed by many intersecting discontinuity sets. Persistence of bedding planes or schistosity DISINTEGRATED - poorly interlocked, heavily broken rock mass with mixture of angular and rounded rock pieces LAMINATED/SHEARED - Lack of blockiness due to close spacing of weak schistosity or shear planes	DECREASING SURFACE QUALITY ➡ 90 80 70 60 50 40 30 20 10 N/A N/A	GSI FOR HETEROGENEOUS ROCK MASSES SUCH AS FLYSCH (Marinos, P and Hoek E., 2000) From a description of the lithology, structure and surface conditions (particularly of the bedding planes), choose a box in the chart. Locate the position in the box that corresponds to the condition of the discontinuities and estimate the average value of GSI from the contours. Do not attempt to be too precise. Quoting a range from 33 to 37 is more realistic than giving GSI = 35. Note that the Hoek-Brown criterion does not apply to structurally controlled failures. Where unfavourably oriented continuous weak planar discontinuities are present, these will dominate the behaviour of the rock mass. The strength of some rock masses is reduced by the presence of groundwater and this can be allowed for by a slight shift to the right in the columns for fair, poor and very poor conditions. Water pressure does not change the value of GSI and it is dealt with by using effective stress analysis.	SURFACE CONDITIONS OF DISCONTINUITIES (Predominantly bedding planes) VERY GOOD - Very Rough, fresh unweathered surfaces GOOD - Rough, slightly weathered surfaces FAIR - Smooth, moderately weathered and altered surfaces POOR - Very smooth, occasionally slickensided surfaces with compact coatings or fillings with angular fragments VERY POOR - Very smooth, slickensided or highly weathered surfaces with soft clay coatings or fillings	COMPOSITION AND STRUCTURE A. Thick bedded, very blocky sandstone. The effect of pelitic coatings on the bedding planes is minimized by the confinement of the rock mass. In shallow tunnels or slopes these bedding planes may cause structurally controlled instability. B. Sandstone with thin inter-layers of siltstone C. Sandstone and siltstone in similar amounts D. Siltstone or silty shale with sandstone layers E. Weak siltstone or clayey shale with sandstone layers F. Tectonically deformed, intensively folded/faulted, sheared clayey shale or siltstone with broken and deformed sandstone layers forming an almost chaotic structure G. Undisturbed silty or clayey shale with or without a few very thin sandstone layers H. Tectonically deformed silty or clayey shale forming a chaotic structure with pockets of clay. Thin layers of sandstone are transformed into small rock pieces. C, D, E, and G - may be more or less folded than illustrated but this does not change the strength. Tectonic deformation, faulting and loss of continuity moves these categories to F and H. ➡ Means deformation after tectonic disturbance	70 60 50 40 30 20 10
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5/14/99

-L-

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GROUP

0 50 100

FEET

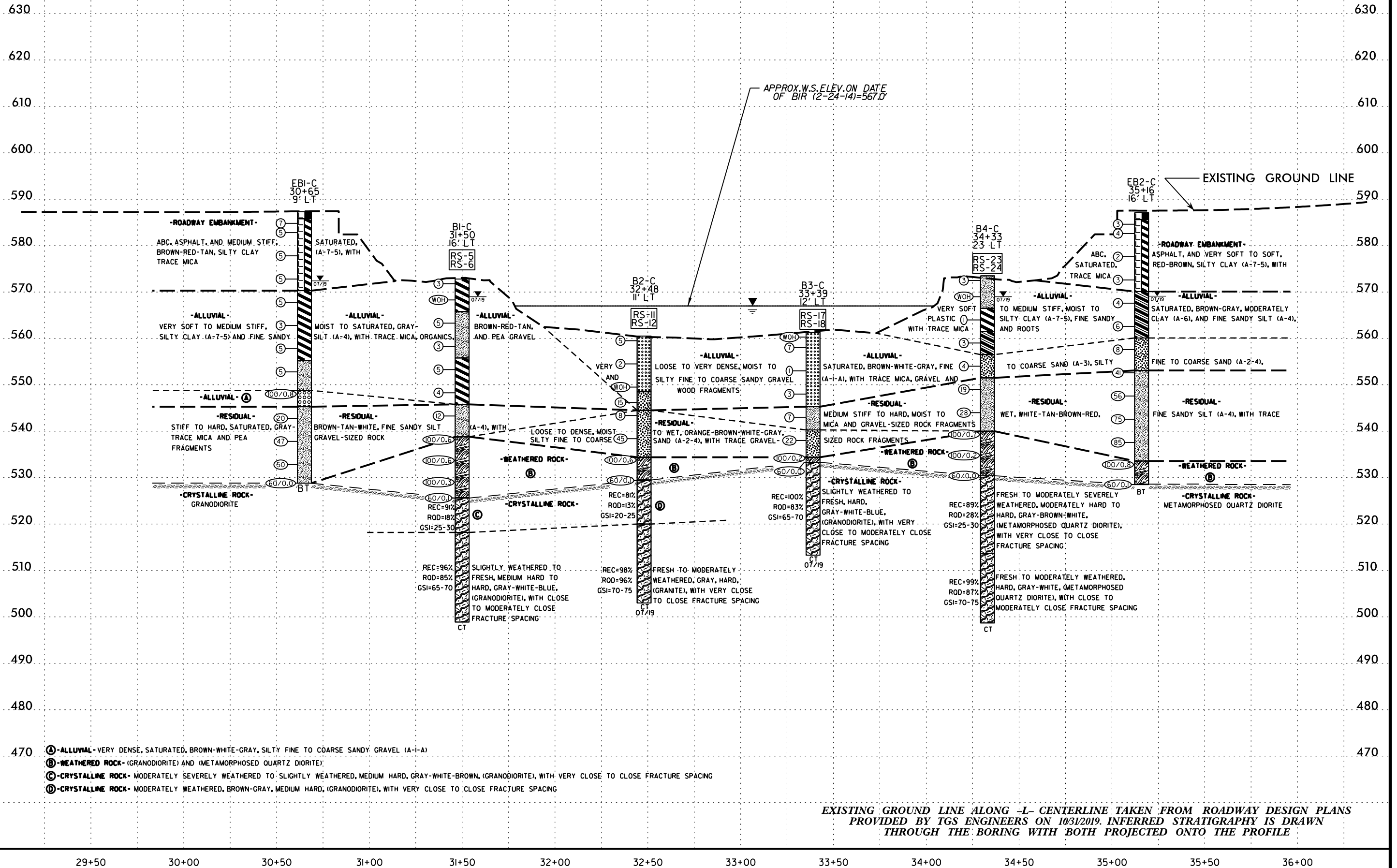
VE = 2.5(H):1(V)

PROJECT REFERENCE NO. SHEET NO.

U-6146

4

REPLACE BRIDGE NO. 82 ON US 29 /74
OVER SOUTH FORK CATAWBA RIVER



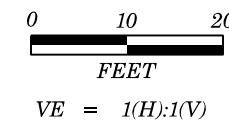
**-L- EXISTING GROUND LINE ALONG END BENT 1 SKEW TAKEN FROM ROADWAY
DESIGN PLANS PROVIDED BY TGS ENGINEERS ON 10/31/19. INFERRED STRATIGRAPHY IS
DRAWN THROUGH THE BORING WITH BOTH PROJECTED ONTO THE CROSS SECTION**

6/23/16

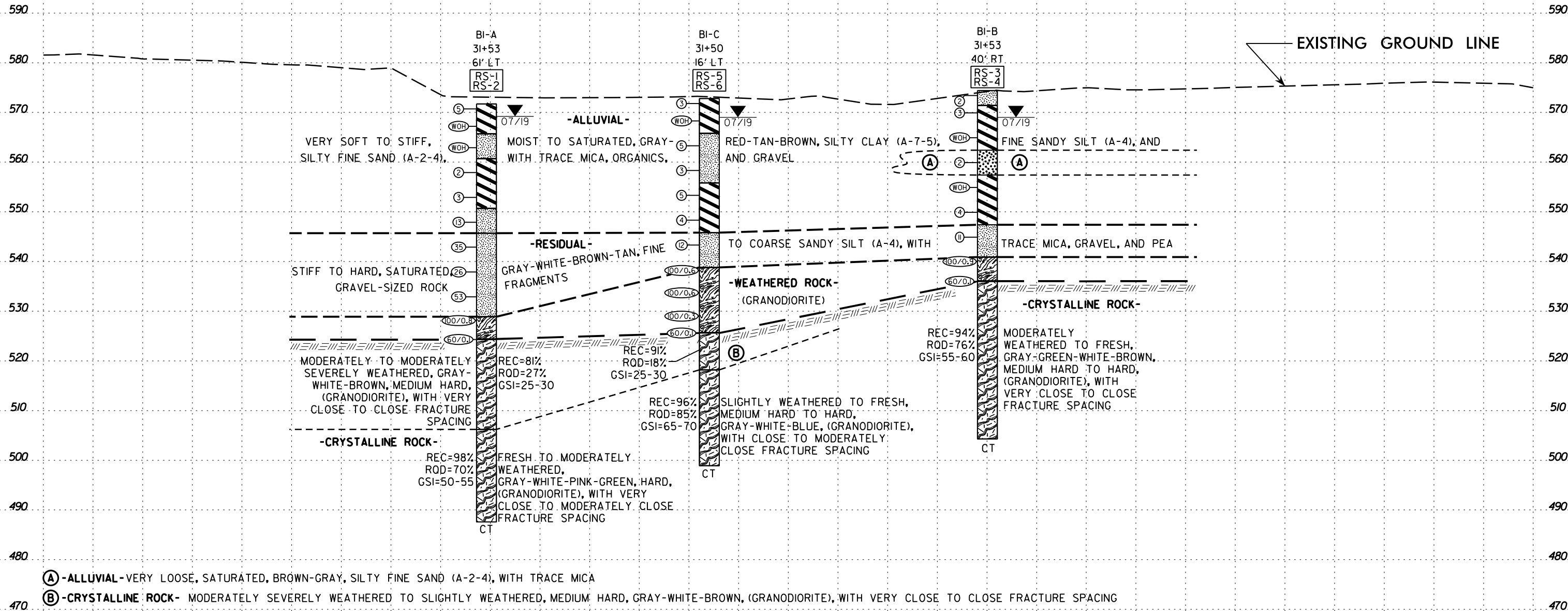
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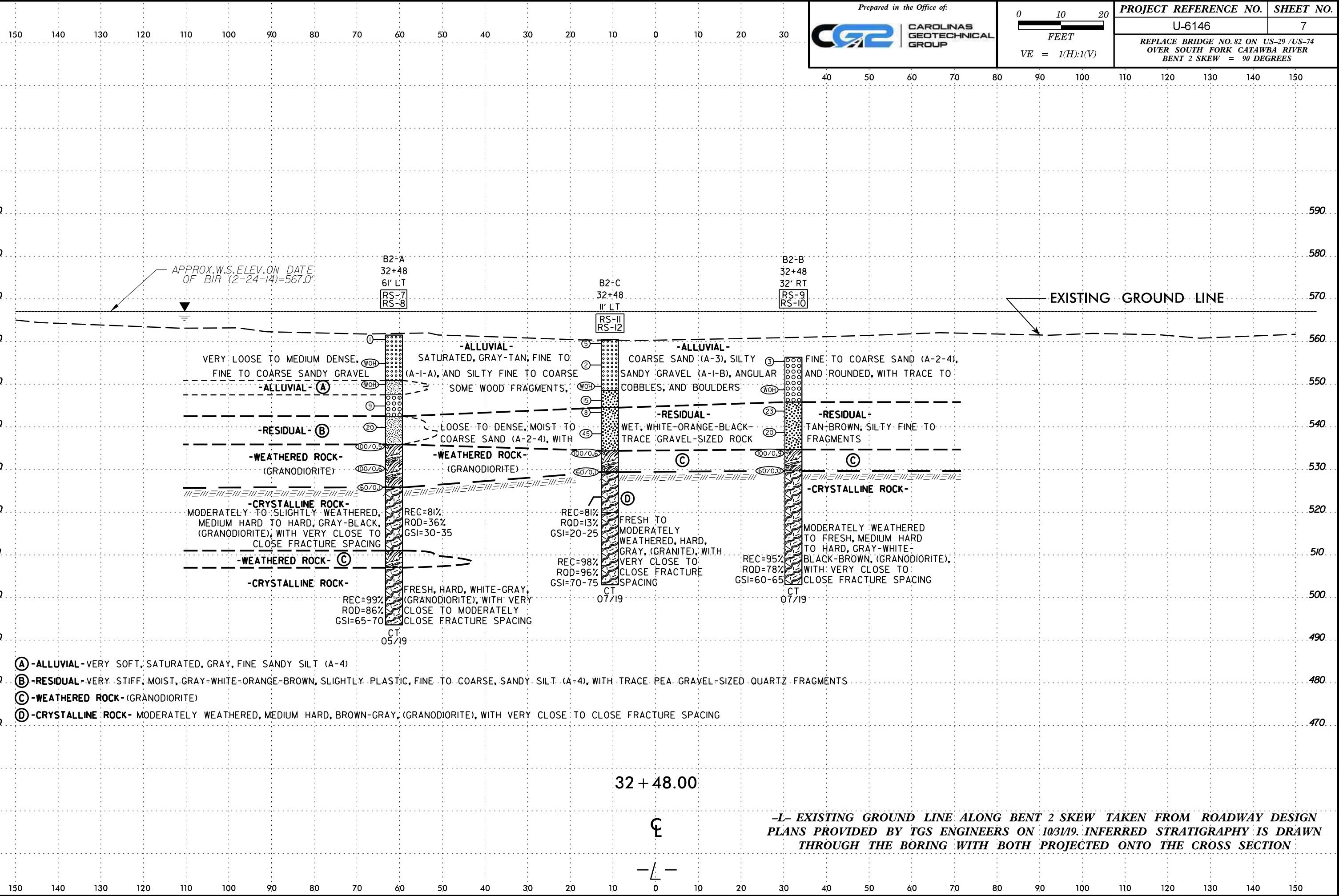
PROJECT REFERENCE NO.	SHEET NO.
U-6146	6
REPLACE BRIDGE NO. 82 ON US-29 /US-74 OVER SOUTH FORK CATAWBA RIVER BENT 1 SKEW = 90 DEGREES	



31 + 58.00



-L- EXISTING GROUND LINE ALONG BENT 1 SKEW TAKEN FROM ROADWAY DESIGN PLANS PROVIDED BY TGS ENGINEERS ON 10/31/19. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORING WITH BOTH PROJECTED ONTO THE CROSS SECTION



$$33 + 38.00$$

Q

— / —

-L- EXISTING GROUND LINE ALONG BENT 3 SKEW TAKEN FROM ROADWAY DESIGN PLANS PROVIDED BY TGS ENGINEERS ON 10/31/19. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORING WITH BOTH PROJECTED ONTO THE CROSS SECTION

6/23/16

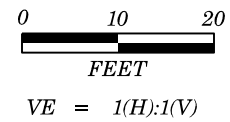
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Prepared in the Office of:

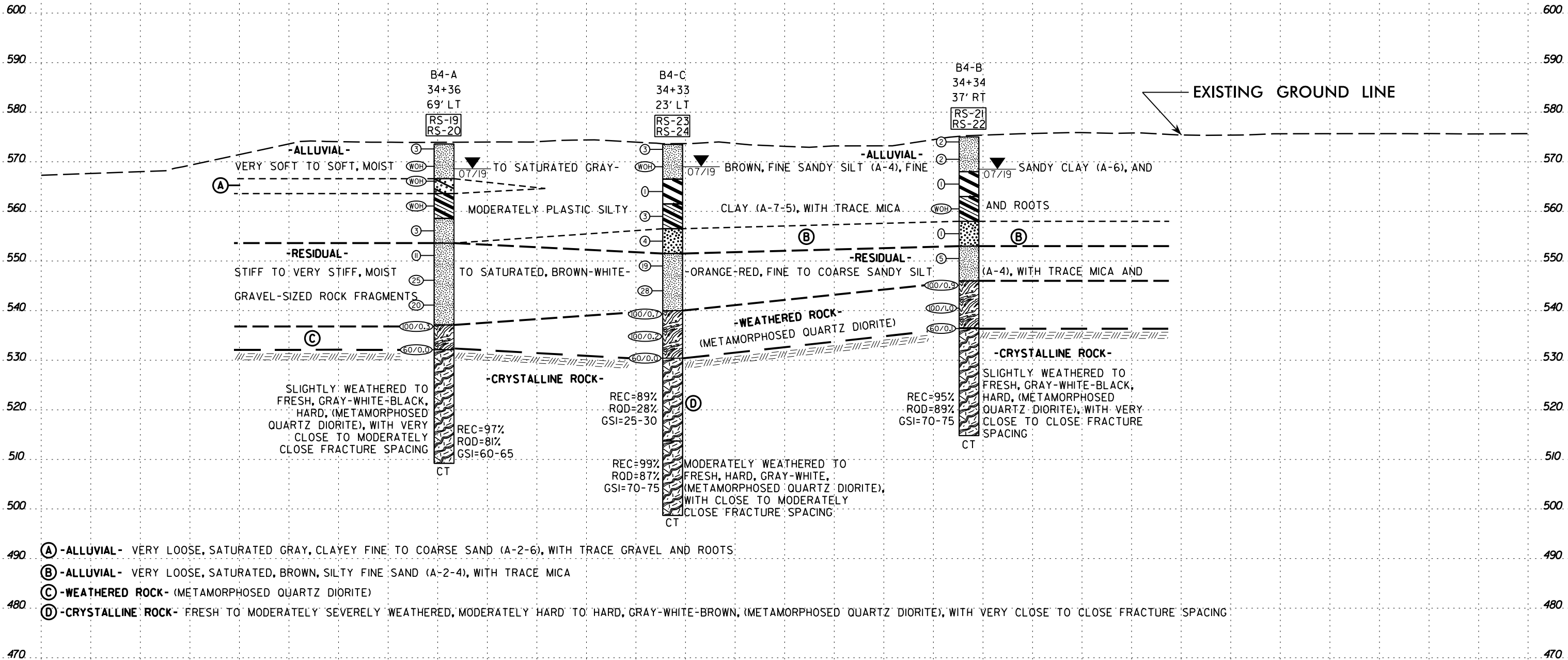


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PROJECT REFERENCE NO.	SHEET NO.
U-6146	9
REPLACE BRIDGE NO. 82 ON US-29 /US-74 OVER SOUTH FORK CATAWBA RIVER BENT 4 SKEW = 90 DEGREES	

40 50 60 70 80 90 100 110 120 130 140 150



34 + 28.00

CL

CL

-L- EXISTING GROUND LINE ALONG BENT 4 SKEW TAKEN FROM ROADWAY DESIGN PLANS PROVIDED BY TGS ENGINEERS ON 10/31/19. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORING WITH BOTH PROJECTED ONTO THE CROSS SECTION

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6/23/16

3:DEC-2020 14:27 C:\Users\johndr\OneDrive - Carolinas Geotechnical Group, PLLC\Projects\0007 - U-6146 Crumerton Bridge and Widening\CADD\GEO\TECH\Site\Sub\U-6146 GEO.BRDG082.XSL.dgn \$\$\$\$USERNAME\$\$\$

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30

150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 10 20 30

Prepared in the Office of:



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GEOTECHNICAL
GROUP

0 10 20

FEET

VE = 1(H):1(V)

PROJECT REFERENCE NO.

U-6146

SHEET NO.

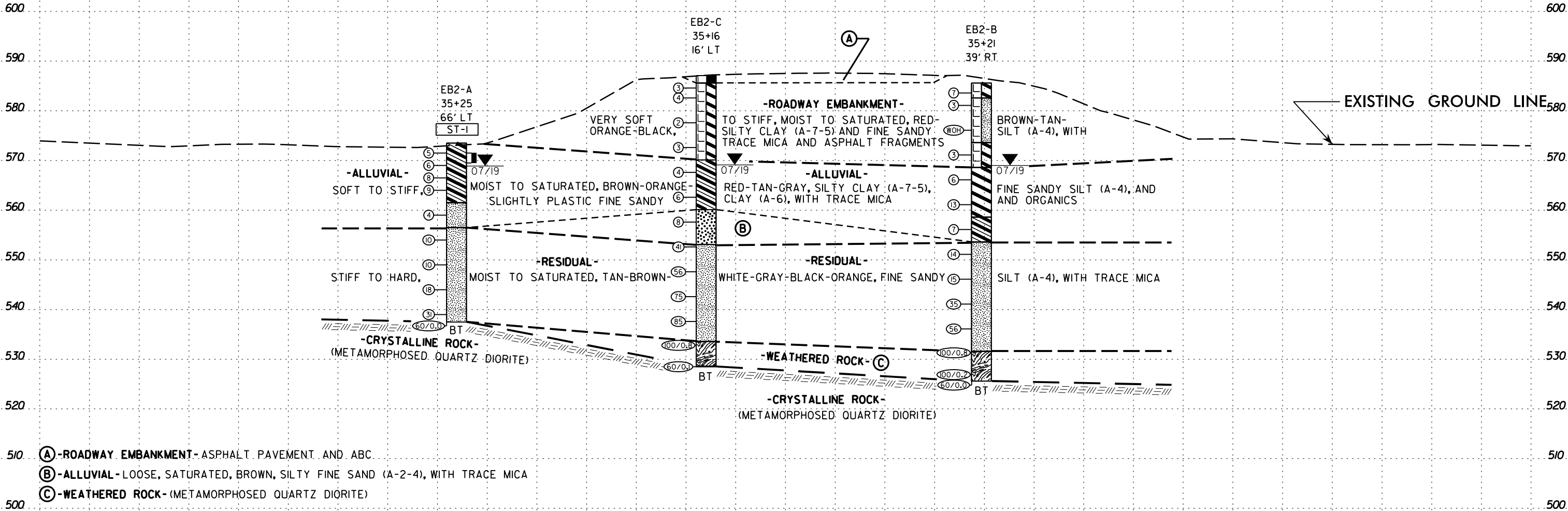
10

REPLACE BRIDGE NO. 82 ON US-29 /US-74
OVER SOUTH FORK CATAWBA RIVER
END BENT 2 SKEW = 90 DEGREES

40 50 60 70 80 90 100 110 120 130 140 150

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
ST-1	66' LT	35+25 -L-	2.0 - 4.0'	A-6(9)	39	11	10.3	18.3	38.4	33.0	99.0	93.5	71.4	35.9	-



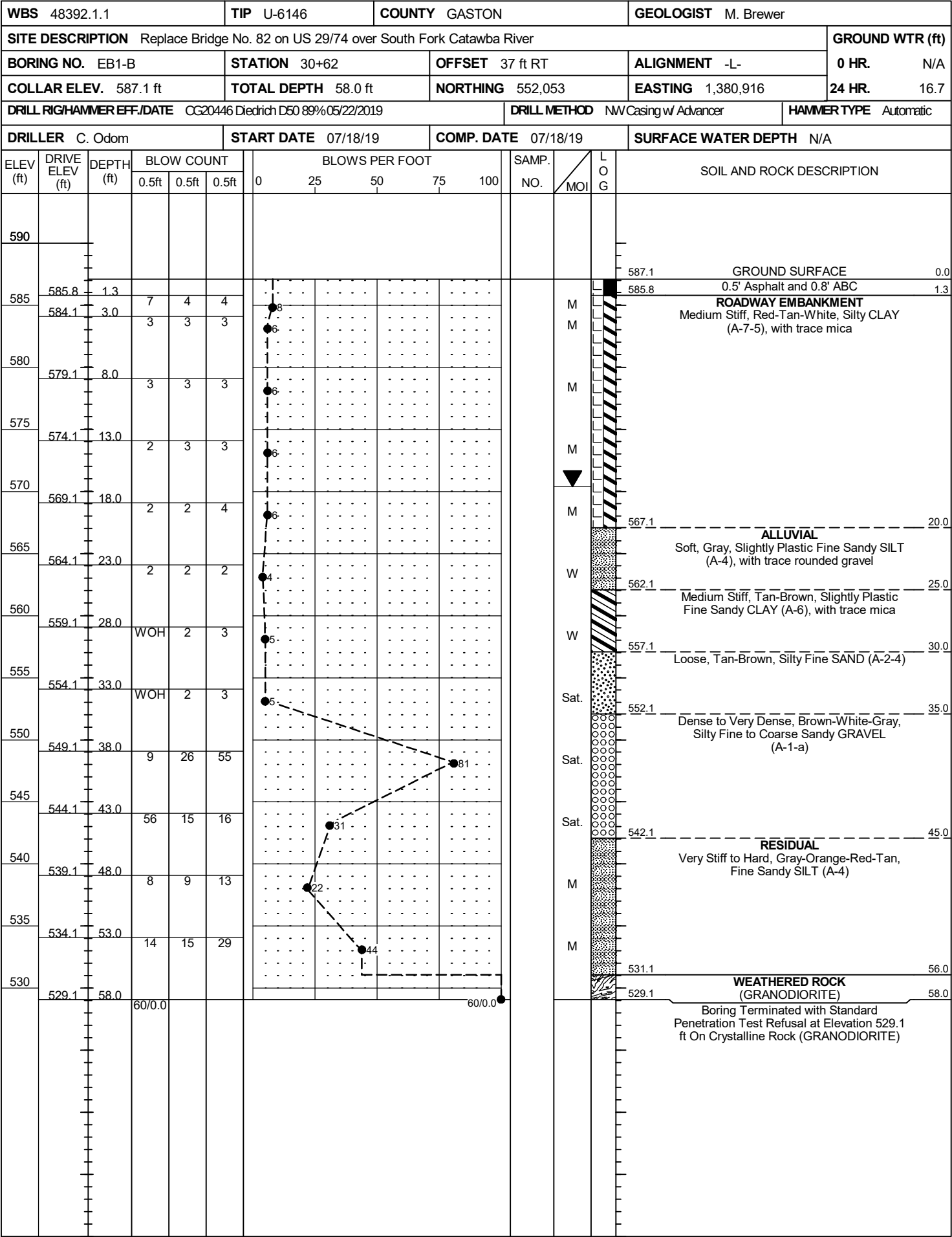
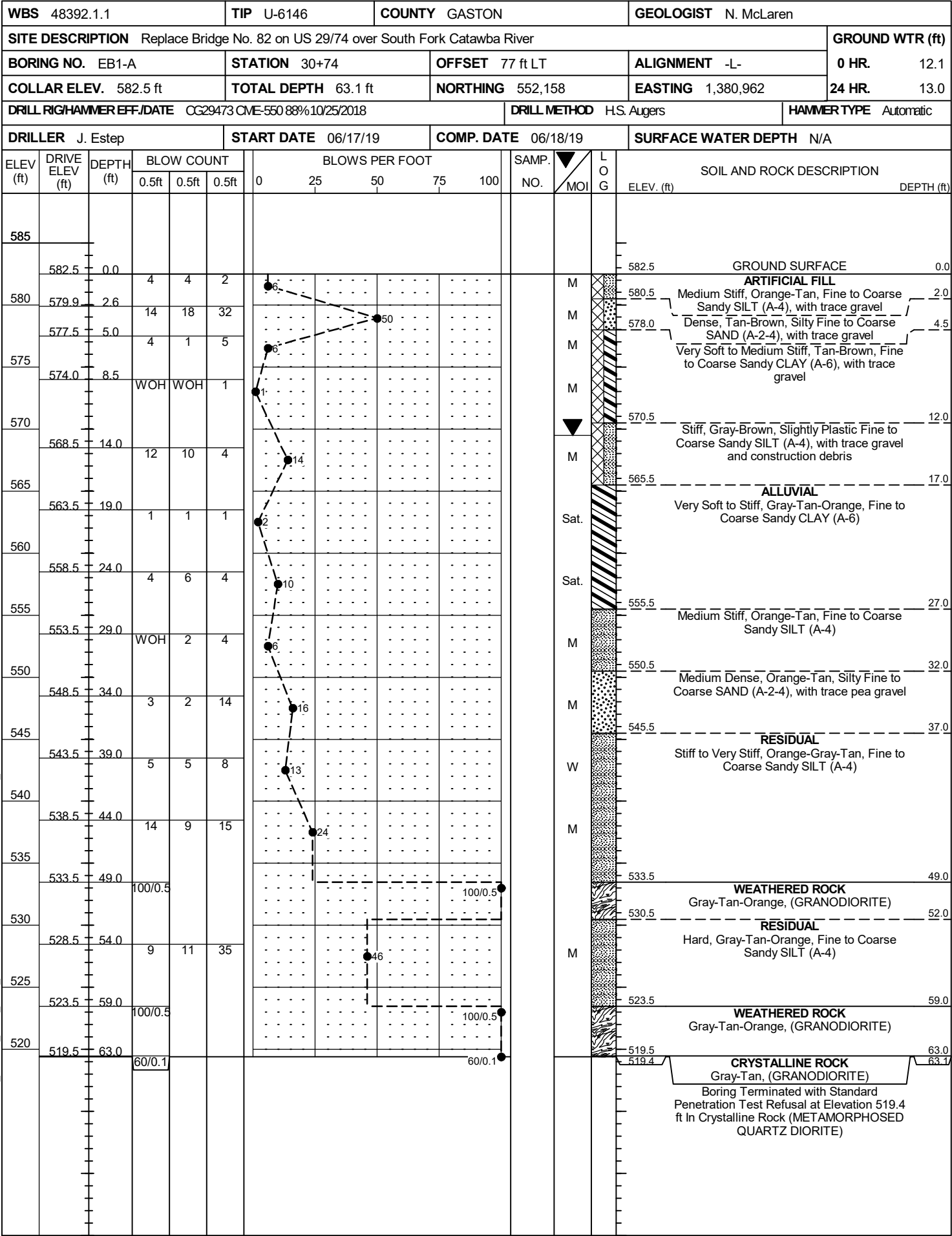
35 + 18.83

CL

-L-

-L- EXISTING GROUND LINE ALONG END BENT 2 SKEW TAKEN FROM ROADWAY
DESIGN PLANS PROVIDED BY TGS ENGINEERS ON 10/31/19. INFERRED STRATIGRAPHY IS
DRAWN THROUGH THE BORING WITH BOTH PROJECTED ONTO THE CROSS SECTION

GEOTECHNICAL BORING REPORT
BORE LOG



NCDOT BORE DOUBLE B-5857_U-6146_GEO_RDY BORINGS-WINDOWS-8ERUV72.GPJ_NC_DOT.GDT 11/15/20

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 48392.1.1			TIP U-6146			COUNTY GASTON			GEOLOGIST C. Keeten						
SITE DESCRIPTION Replace Bridge No. 82 on US 29/74 over South Fork Catawba River											GROUND WTR (ft)				
BORING NO. EB1-C			STATION 30+65			OFFSET 9 ft LT			ALIGNMENT -L-			0 HR. N/A			
COLLAR ELEV. 587.3 ft			TOTAL DEPTH 58.5 ft			NORTHING 552,096			EASTING 1,380,933			24 HR. 14.9			
DRILL RIG/HAMMER EFF./DATE CG20446 Diedrich D50 89%/05/22/2019						DRILL METHOD NW Casing w/ Advancer			HAMMER TYPE Automatic						
DRILLER C. Odom			START DATE 07/18/19			COMP. DATE 07/18/19			SURFACE WATER DEPTH N/A						
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
590															
585	585.8	1.5	2	3	4	7								587.3	GROUND SURFACE 0.0
														585.8	0.6' ABC and 0.9' Asphalt 1.5
	583.8	3.5	1	1	4	5							Sat.		ROADWAY EMBANKMENT Medium Stiff, Brown-Red-Tan, Silty Clay (A-7-5), with trace mica
													Sat.		
580															
	578.8	8.5	2	2	3	5							Sat.		
575															
	573.8	13.5	WOH	2	3	5							Sat.		
570														570.3	ALLUVIAL 17.0
	568.8	18.5	2	2	3	5							Sat.		Soft to Medium Stiff, Gray-Brown, Silty CLAY (A-7-5), with trace mica and pea gravel
565															
	563.8	23.5	2	2	1	3							Sat.		
560															
	558.8	28.5	3	2	3	5							Sat.		
555														555.3	Medium Stiff, Brown-Tan, Fine Sandy SILT (A-4), with trace mica 32.0
	553.8	33.5	2	2	3	5							Sat.		
550														548.8	Very Dense, Brown-White-Gray, Silty Fine to Coarse Sandy GRAVEL (A-1-a) 38.5
	548.8	38.5	10	90/0.3						100/0.8			Sat.		
545														545.3	42.0
	543.8	43.5	7	7	13	20							Sat.		RESIDUAL Very Stiff to Hard, Brown-Tan-White, Fine Sandy SILT (A-4), with trace mica
540															
	538.8	48.5	14	23	24	47							Sat.		
535															
	533.8	53.5	16	19	31	50							Sat.		
530														528.8	CRYSTALLINE ROCK (GRANODIORITE) 58.5
	528.8	58.5	60/0.0							60/0.0					Boring Terminated with Standard Penetration Test Refusal at Elevation 528.8 ft On Crystalline Rock (GRANODIORITE)

NCDOT BORE DOUBLE B-5857_U-6146_GEO_RDY BORINGS-WINDOWS-8ERUV72.GPJ NC_DOT.GDT 11/15/20

WCDOT BORE DOUBLE B-5857_U-6146_GEO_RDY_BORINGS-WINDOWS-8ERUV72.GPJ NC DOT.GDT 11/15/20

WBS 48392.1.1				TIP U-6146		COUNTY GASTON		GEOLOGIST C. Keeten					
SITE DESCRIPTION Replace Bridge No. 82 on US 29/74 over South Fork Catawba River								GROUND WTR (ft)					
BORING NO. B1-A				STATION 31+53		OFFSET 61 ft LT		ALIGNMENT -L-		0 HR. N/A			
COLLAR ELEV. 571.7 ft				TOTAL DEPTH 84.1 ft		NORTHING 552,118		EASTING 1,381,032		24 HR. 2.5			
DRILL RIG/HAMMER EFF./DATE CG20446 Diedrich D50 89%05/22/2019						DRILL METHOD NW Casing w/ Core			HAMMER TYPE Automatic				
DRILLER C. Odom				START DATE 07/16/19		COMP. DATE 07/17/19		SURFACE WATER DEPTH N/A					
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT				SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
			0.5ft	0.5ft	0.5ft	0	25	50	75	100			
495						Match Line							
490													

GEOTECHNICAL BORING REPORT
CORE LOG

WBS 48392.1.1					TIP U-6146			COUNTY GASTON			GEOLOGIST C. Keeten				
SITE DESCRIPTION Replace Bridge No. 82 on US 29/74 over South Fork Catawba River											GROUND WTR (ft)				
BORING NO. B1-A					STATION 31+53				OFFSET 61 ft LT			ALIGNMENT -L-		0 HR.	N/A
COLLAR ELEV. 571.7 ft					TOTAL DEPTH 84.1 ft				NORTHING 552,118			EASTING 1,381,032		24 HR.	2.5
DRILL RIG/HAMMER EFF./DATE CG20446 Diedrich D50 89% 05/22/2019									DRILL METHOD NW Casing w/ Core				HAMMER TYPE Automatic		
DRILLER C. Odom					START DATE 07/16/19				COMP. DATE 07/17/19			SURFACE WATER DEPTH N/A			
CORE SIZE NQ					TOTAL RUN 36.7 ft										
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN		SAMP. NO.	STRATA		L O G	DESCRIPTION AND REMARKS				
					REC. (ft) %	ROD (ft) %		REC. (ft) %	ROD (ft) %						
524.3															
	524.3	47.4	1.7	1:42/1.0	(0.3)	(0.0)		(14.6)	(4.8)		524.3	Begin Coring @ 47.4 ft			
	522.6	49.1		2:49/0.7	18%	0%	RS-1	81%	27%		CRSTALLINE ROCK				
			5.0	7:26/1.0	(3.2)	(1.8)					Moderately to Moderately Severly Weathered, Gray-White-Brown, Medium				
520				2:04/1.0	64%	36%					Hard, (GRANODIORITE), with Very Close to Close Fracture Spacing				
				1:58/1.0											
	517.6	54.1		3:05/1.0							RS-1: 49.1 - 49.9'				
			5.0	3:30/1.0							Unit Weight: 174.4 pcf				
				3:46/1.0	(5.0)	(1.9)					Unconfined Compressive Strength: 7,880 psi (1,135 ksf)				
				2:44/1.0	100%	38%					RS-2: 61.2 - 62.0'				
				2:24/1.0							Unit Weight: 170.5 pcf				
	512.6	59.1		1:54/1.0							Unconfined Compressive Strength: 1,420 psi (205 ksf)				
			5.0	2:17/1.0	(5.0)	(1.1)	RS-2				GSI=25-30				
				3:27/1.0	(5.0)	(1.1)									
			5.0	3:00/1.0	100%	22%									
				2:32/1.0											
				3:27/1.0											
	507.6	64.1		2:03/1.0											
			5.0	3:16/1.0	(4.7)	(1.6)		(18.2)	(13.0)		506.2	65.5			
				4:11/1.0	94%	32%		98%	70%		Fresh to Moderate Weathering, Gray-White-Pink-Green, Hard,				
				5:09/1.0							(GRANODIORITE), with Very Close to Moderately Close Fracture				
			5.0	1:52/1.0							Spacing				
				2:10/1.0							GSI=50-55				
				2:58/1.0	(5.0)	(3.0)									
				1:46/1.0	100%	60%									
				2:40/1.0											
				2:55/1.0											
	497.6	74.1		3:11/1.0	(4.9)	(3.9)									
			5.0	4:06/1.0	98%	78%									
				3:56/1.0											
				4:28/1.0											
				3:55/1.0											
	492.6	79.1		4:36/1.0	(5.0)	(4.5)									
			5.0	5:35/1.0	100%	90%									
				4:22/1.0											
				6:04/1.0											
				4:37/1.0											
	487.6	84.1		4:27/1.0							487.6	84.1			
											Boring Terminated at Elevation 487.6 ft In Crystalline Rock				
											(GRANODIORITE)				

NCDOT CORE DOUBLE B-5857_U-6146_GEO_RDY_BORINGS-WINDOWS-8ERUV72.GPJ NC_DOT_GDT 11/15/20



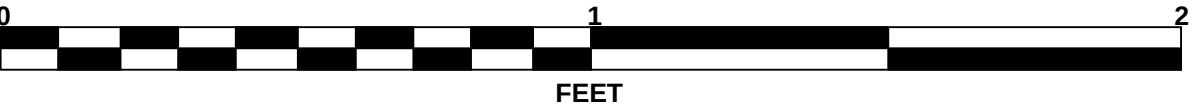
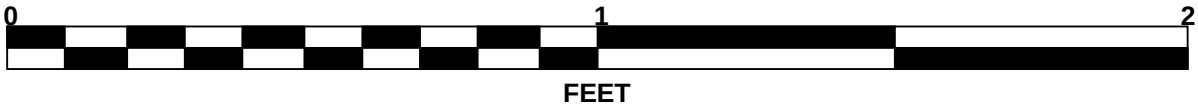
Replace Bridge No. 82 on US 29/74 over South Fork Catawba River

Rock Core Photographs

Boring - B1-A -L- Station 31+53 61' LT

Box 1 & 2: 47.4 to 68.0 Feet

Box 3: 68.0 to 84.1 Feet



NCDOT BORE DOUBLE B-5857_U-6146 GEO_RDY BORINGS-WINDOWS-8ERUV72.GPJ NC DOT.GDT 11/15/20

WBS 48392.1.1				TIP U-6146				COUNTY GASTON				GEOLOGIST C. Keeten										
SITE DESCRIPTION Replace Bridge No. 82 on US 29/74 over South Fork Catawba River												GROUND WTR (ft)										
BORING NO. B1-B				STATION 31+53				OFFSET 40 ft RT				ALIGNMENT -L-				0 HR. N/A						
COLLAR ELEV. 574.4 ft				TOTAL DEPTH 70.1 ft				NORTHING 552,022				EASTING 1,381,001				24 HR. 5.4						
DRILL RIG/HAMMER EFF./DATE CG20446 Diedrich D50 89% 05/22/2019								DRILL METHOD NW Casing w/ Core				HAMMER TYPE Automatic										
DRILLER C. Odum				START DATE 07/10/19				COMP. DATE 07/11/19				SURFACE WATER DEPTH N/A										
CORE SIZE NQ				TOTAL RUN 31.7 ft																		
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %ROD (ft) %		SAMP. NO.	STRATA REC. (ft) %ROD (ft) %		L O G	DESCRIPTION AND REMARKS DEPTH (ft)											
536											Begin Coring @ 38.4 ft											
535	536.0 534.3	38.4 40.1	1.7	3:02/1.0 2:15/0.7	(1.7) 100%	(0.6) 35%		(29.8) 94%	(24.0) 76%		536.0 CRYSTALLINE ROCK 38.4 Moderately Weathered to Fresh, Gray-Green-White-Brown, Medium Hard to Hard, (GRANODIORITE), with Very Close to Close Fracture Spacing											
			5.0	3:09/1.0 2:20/1.0 3:02/1.0 5:45/1.0 3:45/1.0	(4.5) 90%	(3.8) 76%	RS-3				RS-3: 41.1 - 42.0' Unit Weight: 170.5 pcf Unconfined Compressive Strength: 9,260 psi (1,333 ksf)											
530	529.3	45.1									RS-4: 49.4 - 50.2' Unit Weight: 165.0 pcf Unconfined Compressive Strength: 2,780 psi (400 ksf)											
			5.0	3:11/1.0 2:52/1.0 2:51/1.0 3:20/1.0 3:24/1.0	(4.5) 90%	(3.8) 76%					GSI=55-60											
525	524.3	50.1					RS-4															
			5.0	2:36/1.0 1:58/1.0 2:09/1.0 3:20/1.0 3:47/1.0	(4.1) 82%	(2.6) 52%																
520	519.3	55.1																				
			5.0	4:57/1.0 4:00/1.0 4:34/1.0 4:37/1.0 2:56/1.0	(5.0) 100%	(4.0) 80%																
515	514.3	60.1																				
			5.0	5:22/1.0 4:07/1.0 3:51/1.0 3:35/1.0 3:33/1.0	(5.0) 100%	(4.8) 96%																
510	509.3	65.1																				
			5.0	4:30/1.0 3:39/1.0 5:27/1.0 4:06/1.0 4:43/1.0	(5.0) 100%	(4.4) 88%																
505	504.3	70.1								504.3	Boring Terminated at Elevation 504.3 ft In Crystalline Rock (GRANODIORITE) 70.1											

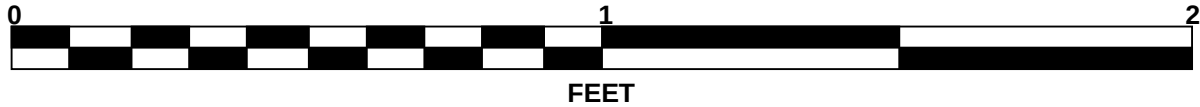
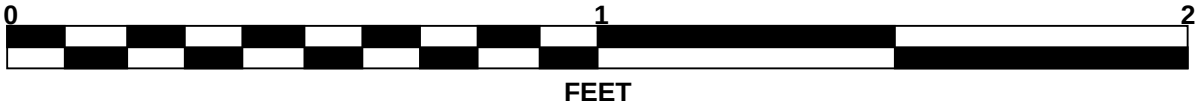
Replace Bridge No. 82 on US 29/74 over South Fork Catawba River

Rock Core Photographs

Boring - B1-B -L- Station 31+53, 40 ' RT

Box 1 & 2: 38.4 to 57.8 Feet

Box 3 & 4: 57.8 to 70.1 Feet



NC DOT BORE DOUBLE B-5857 U-6146 GEO RDY BORINGS-WINDOWS-8ERUV72.GPJ NC DOT.GDT 11/15/20

WBS 48392.1.1				TIP U-6146				COUNTY GASTON				GEOLOGIST C. Keeten							
SITE DESCRIPTION Replace Bridge No. 82 on US 29/74 over South Fork Catawba River												GROUND WTR (ft)							
BORING NO. B1-C				STATION 31+50				OFFSET 16 ft LT				ALIGNMENT -L-				0 HR. N/A			
COLLAR ELEV. 572.8 ft				TOTAL DEPTH 73.9 ft				NORTHING 552,076				EASTING 1,381,016				24 HR. 3.8			
DRILL RIG/HAMMER EFF./DATE CG20446 Diedrich D50 89%/05/22/2019								DRILL METHOD NW Casing w/ Core				HAMMER TYPE Automatic							
DRILLER C. Odom				START DATE 07/11/19				COMP. DATE 07/16/19				SURFACE WATER DEPTH N/A							
CORE SIZE NQ				TOTAL RUN 26.7 ft															
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) % ROD (ft) %		SAMP. NO.	STRATA REC. (ft) % ROD (ft) %		L O G	DESCRIPTION AND REMARKS								
525.6											Begin Coring @ 47.2 ft								
525.6	525.6	47.2	1.7	1:45/1.0	(1.0)	(0.4)		(6.7)	(1.3)		525.6					47.2			
	523.9	48.9	5.0	2:54/0.7	59%	24%		91%	18%		CRYSTALLINE ROCK								
				2:56/1.0	(5.0)	(0.9)					Moderately Severely Weathered to Slightly Weathered, Medium Hard, Gray-White-Brown, (GRANODIORITE), with Very Close to Close Fracture Spacing								
520				2:50/1.0	100%	18%					Spacing								
	518.9	53.9		4:33/1.0							GSI=25-30								
				3:59/1.0							518.2					54.6			
			5.0	3:43/1.0							CRYSTALLINE ROCK								
				1:27/1.0	(4.3)	(2.9)	RS-5	(18.6)	(16.4)		Slightly Weathered to Fresh, Medium Hard to Hard, Gray-White-Blue, (GRANODIORITE), with Close to Moderately Close Fracture Spacing								
515				1:58/1.0	86%	58%		96%	85%		RS-5: 54.4 - 55.0'								
	513.9	58.9		3:09/1.0	(5.0)	(4.3)	RS-6				Unit Weight: 168.7 pcf								
				4:00/1.0	100%	86%				Unconfined Compressive Strength: 4,090 psi (588 ksf)									
			5.0	4:41/1.0						RS-6: 58.2 - 58.9'									
510				3:57/1.0	(5.0)	(4.6)				Unit Weight: 172.7 pcf									
				3:46/1.0	100%	92%				Unconfined Compressive Strength: 5,700 psi (821 ksf)									
	508.9	63.9		3:21/1.0						GSI=65-70									
				2:10/1.0						503.9					68.9				
505			5.0	2:49/1.0	(5.0)	(4.6)				500									
				3:09/1.0	(5.0)	(4.6)				498.9					73.9				
	503.9	68.9		3:40/1.0	100%	92%				Boring Terminated at Elevation 498.9 ft in Crystalline Rock (GRANODIORITE)									
500			5.0	5:55/1.0															
				5:30/1.0															
	498.9	73.9		5:15/1.0															
				5:47/1.0	(5.0)	(4.6)													
				6:46/1.0	100%	92%													
				6:36/1.0															
				4:13/1.0															
				3:03/1.0															



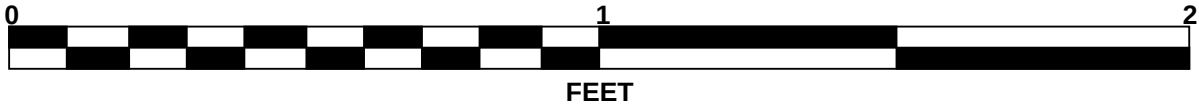
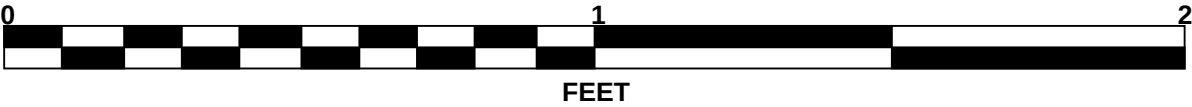
Replace Bridge No. 82 on US 29/74 over South Fork Catawba River

Rock Core Photographs

Boring - B1-C -L- Station , 31+50, 16' LT

Box 1 & 2: 47.2 to 67.1 Feet

Box 3: 67.1 to 73.9 Feet



NCNDOT BORE DOUBLE B-5857 U-6146 GEO_RDY BORINGS-WINDOWS-8ERUV72.GPJ NC_DOT.GDT 11/15/20

WBS 48392.1.1				TIP U-6146		COUNTY GASTON		GEOLOGIST M. Brewer					
SITE DESCRIPTION Replace Bridge No. 82 on US 29/74 over South Fork Catawba River								GROUND WTR (ft)					
BORING NO. B2-A				STATION 32+48		OFFSET 61 ft LT		ALIGNMENT -L-		0 HR. N/A			
COLLAR ELEV. 561.5 ft				TOTAL DEPTH 67.9 ft		NORTHING 552,089		EASTING 1,381,123		24 HR. N/A			
DRILL RIG/HAMMER EFF./DATE MD0314 D-25 83% 02/28/2019						DRILL METHOD SPT Core Boring			HAMMER TYPE Automatic				
DRILLER B. Fowler				START DATE 05/15/19		COMP. DATE 05/16/19		SURFACE WATER DEPTH 6.5ft					
CORE SIZE NQ				TOTAL RUN 32.2 ft									
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	ROD (ft) %	SAMP. NO.	STRATA REC. (ft) %	RQD (ft) %	L O G	DESCRIPTION AND REMARKS		
525.8											Begin Coring @ 35.7 ft		
525	525.8	35.7	2.2	1:50/0.2	(2.0)	(0.9)		(12.0)	(5.3)		525.8	CRSTALLINE ROCK	35.7
	523.6	37.9		6:01/1.0	91%	41%		81%	36%		Moderately to Slightly Weathered, Medium Hard to Hard, Gray-Black, (GRANODIORITE), with Very Close to Close Fracture Spacing		
			5.0	6:55/1.0			RS-7				RS-7: 38.2 - 39.2'		
				3:30/1.0	(2.9)	(0.9)					Unit Weight: 169.2 pcf		
520				2:22/1.0	58%	18%					Unconfined Compressive Strength: 16,470 psi (2,371 ksf)		
				3:15/1.0									
	518.6	42.9		4:09/1.0									
			5.0	3:12/1.0									
				3:53/1.0	(4.5)	(3.1)							
515				3:12/1.0	90%	62%							
				3:16/1.0									
			5.0	3:30/1.0			RS-8						
	513.6	47.9		3:40/1.0									
			5.0	4:13/1.0	(2.6)	(0.4)							
510				3:42/1.0	52%	8%							
				4:45/1.0									
			5.0	6:46/1.0				(0.0)	(0.0)	511.0	GSI=30-35	50.5	
	508.6	52.9	5.0	2:49/1.0				0%	0%		WEATHERED ROCK (GRANODIORITE)		
				0:26/1.0	(3.4)	(2.5)							
505				3:02/1.0	68%	50%		(13.3)	(11.5)	507.0	CRSTALLINE ROCK	54.5	
			5.0	3:33/1.0				99%	86%		Fresh, Hard, White, Gray, (GRANODIORITE), with Very Close to Moderately Close Fracture Spacing		
	503.6	57.9		4:07/1.0									
			5.0	4:25/1.0							GSI=65-70		
				5:17/1.0	(5.0)	(4.9)							
500				5:43/1.0	100%	98%							
				4:42/1.0									
	498.6	62.9		5:25/1.0									
			5.0	5:20/1.0	(4.9)	(4.1)							
				7:01/1.0	98%	82%							
495				7:14/1.0									
	493.6	67.9		8:38/1.0									
				6:37/1.0									
				5:37/1.0									
											Boring Terminated at Elevation 493.6 ft In Crystalline Rock (GRANODIORITE)	67.9	



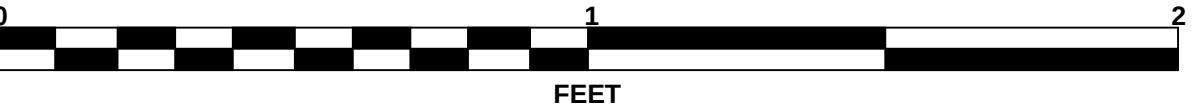
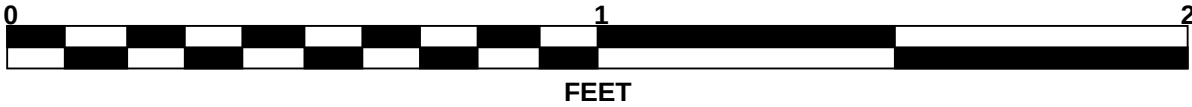
Replace Bridge No. 82 on US 29/74 over South Fork Catawba River

Rock Core Photographs

Boring - B2-A -L- Station 32+48, 61' LT

Box 1 & 2: 35.7 to 59.9 Feet

Box 3: 59.9 to 67.9 Feet



NC DOT BORE DOUBLE B-5857 U-6146 GEO RDY BORINGS-WINDOWS-8ERUV72.GPJ NC DOT.GDT 11/15/20

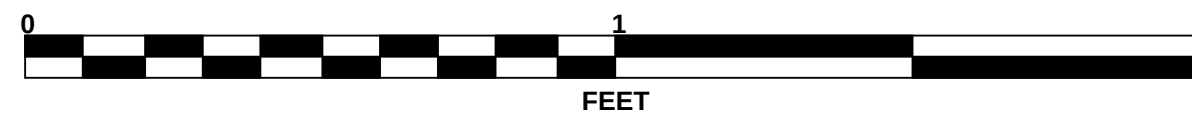
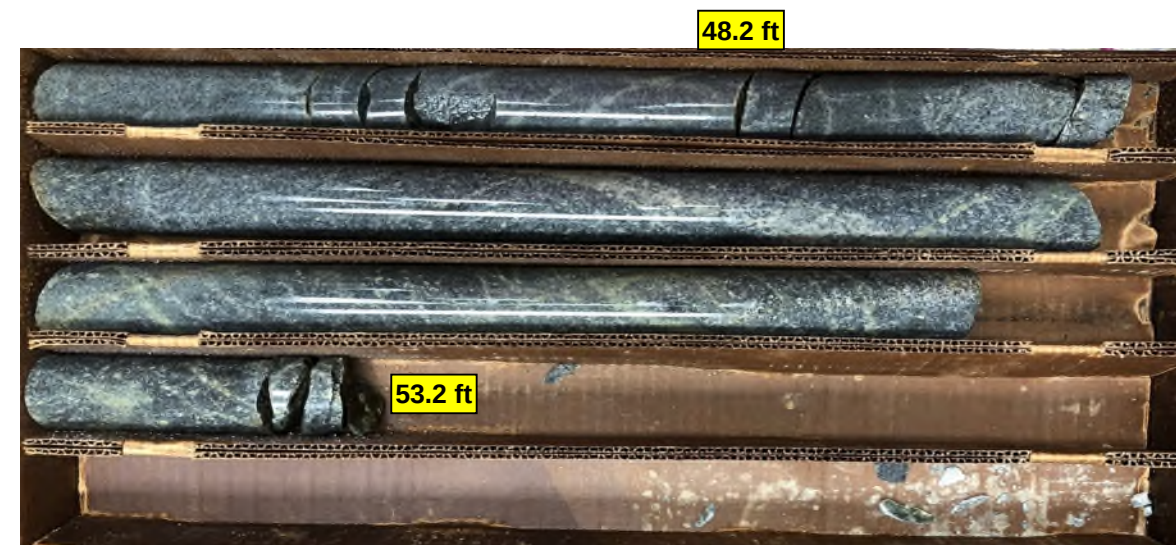
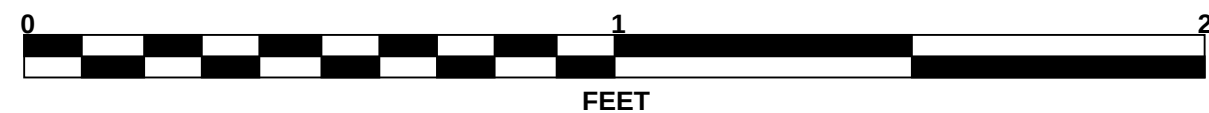
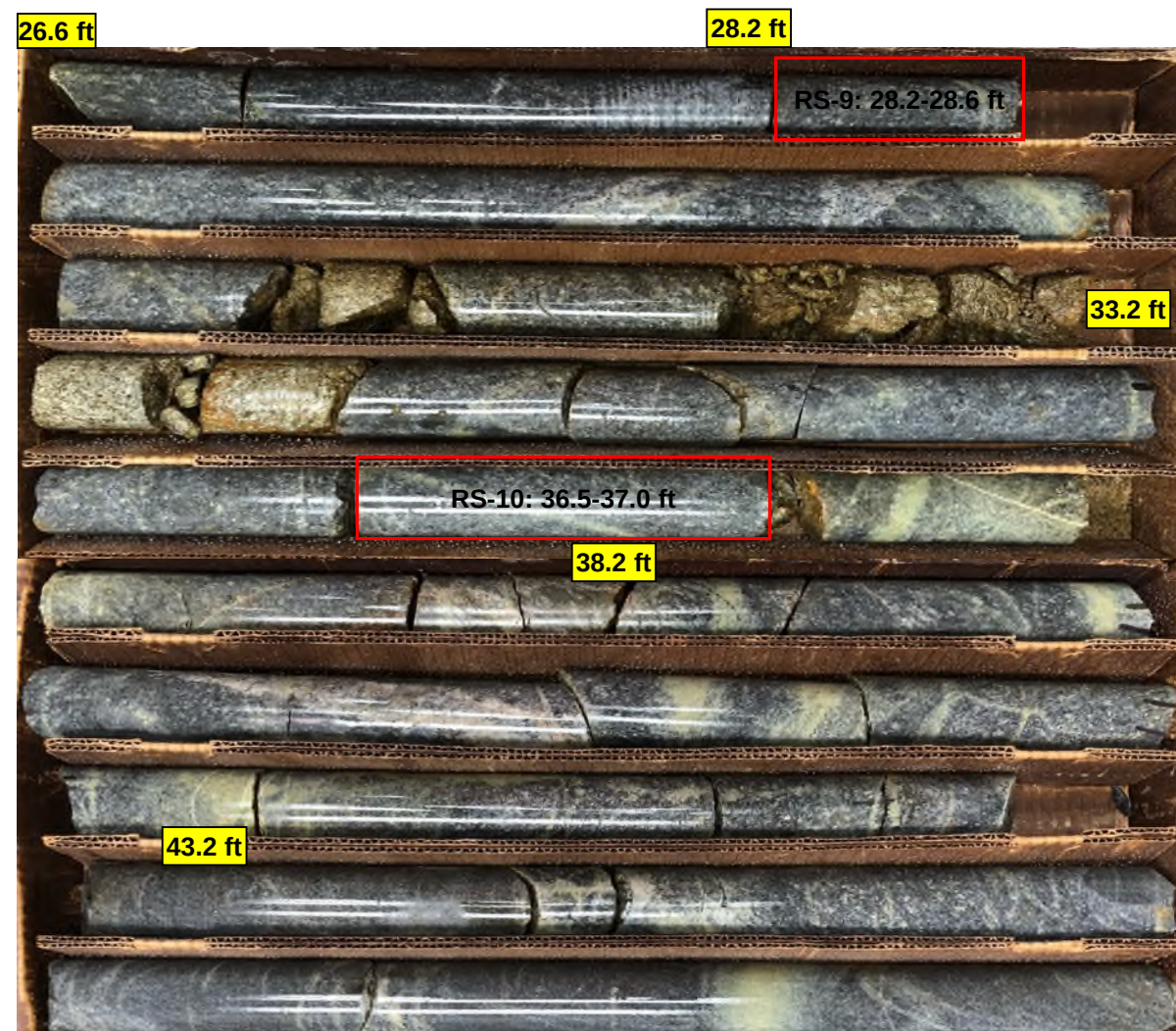
WBS 48392.1.1		TIP U-6146		COUNTY GASTON		GEOLOGIST M. Brewer								
SITE DESCRIPTION Replace Bridge No. 82 on US 29/74 over South Fork Catawba River							GROUND WTR (ft)							
BORING NO. B2-B		STATION 32+48		OFFSET 32 ft RT		ALIGNMENT -L-		0 HR.	N/A					
COLLAR ELEV. 556.3 ft		TOTAL DEPTH 53.2 ft		NORTHING 552,000		EASTING 1,381,094		24 HR.	N/A					
DRILL RIG/HAMMER EFF./DATE CG20446 Diedrich D50 89%/05/22/2019				DRILL METHOD NW Casing w/ Core			HAMMER TYPE Automatic							
DRILLER C. Odom		START DATE 07/21/19		COMP. DATE 07/22/19		SURFACE WATER DEPTH 11.9ft								
CORE SIZE NQ		TOTAL RUN 26.6 ft												
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %		ROD (ft) %	SAMP. NO.	STRATA REC. (ft) %		ROD (ft) %	L O G	DESCRIPTION AND REMARKS	
529.7	529.7	26.6	1.6	N=60/0.0	(1.3)	(1.3)			(25.2)	(20.8)			Begin Coring @ 26.6 ft	
	528.1	28.2	5.0	8:17/1.0	81%	81%			95%	78%			529.7	CRYSTALLINE ROCK
				5:21/0.6	(4.3)	(3.2)		RS-9						Moderately Weathered to Fresh, Medium Hard to Hard, Gray-White-Black-Brown, (GRANODIORITE), with Very Close to Close Fracture Spacing
525				3:39/1.0	86%	64%								
				3:00/1.0										
				3:12/1.0										
	523.1	33.2		2:57/1.0										RS-9: 28.2 - 28.6'
			5.0	3:10/1.0	(4.8)	(2.8)								Unit Weight: 176.6 pcf
520				4:10/1.0	96%	56%								Unconfined Compressive Strength: 6,310 psi (909 ksf)
				4:26/1.0										
				4:42/1.0										
	518.1	38.2		4:10/1.0				RS-10					RS-10: 36.5 - 37.0'	
			5.0	5:34/1.0	(5.0)	(4.5)							Unit Weight: 174.6 pcf	
				4:17/1.0	100%	90%							Unconfined Compressive Strength: 7,160 psi (1,031 ksf)	
				5:43/1.0										
515				5:44/1.0										
				4:54/1.0										
	513.1	43.2		2:57/1.0	(5.0)	(4.7)							GSI=60-65	
			5.0	3:16/1.0	100%	94%								
				3:37/1.0										
510				3:26/1.0										
				3:21/1.0										
	508.1	48.2		4:09/1.0	(4.8)	(4.3)								
			5.0	6:28/1.0	96%	86%								
				4:14/1.0										
505				5:11/1.0										
				4:15/1.0										
	503.1	53.2		4:18/1.0									503.1	
													Boring Terminated at Elevation 503.1 ft In Crystalline Rock (GRANODIORITE)	

Replace Bridge No. 82 on US 29/74 over South Fork Catawba River**Rock Core Photographs**

Boring - B2-B -L- Station , 32+48 32' RT

Box 1 & 2: 26.6 to 47.1 Feet

Box 3: 47.1 to 53.2 Feet



UNC.DOT.BORE.DOUBLE B-5857 IL-6146 GEO BDV BORINGS.GPI NC DOT.GDT 12/31/20

WBS 48392.1.1				TIP U-6146				COUNTY GASTON				GEOLOGIST M. Brewer					
SITE DESCRIPTION Replace Bridge No. 82 on US 29/74 over South Fork Catawba River												GROUND WTR (ft)					
BORING NO. B2-C				STATION 32+48				OFFSET 11 ft LT				ALIGNMENT -L-				0 HR. N/A	
COLLAR ELEV. 560.5 ft				TOTAL DEPTH 57.5 ft				NORTHING 552,041				EASTING 1,381,107				24 HR. N/A	
DRILL RIG/HAMMER EFF./DATE CG20446 Diedrich D50 89%/05/22/2019								DRILL METHOD NW Casing w/ Core				HAMMER TYPE Automatic					
DRILLER C. Odom				START DATE 07/25/19				COMP. DATE 07/25/19				SURFACE WATER DEPTH 7.4ft					
CORE SIZE NQ				TOTAL RUN 26.4 ft													
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) % RQD (ft) %		SAMP. NO.	STRATA REC. (ft) % RQD (ft) %		L O G	DESCRIPTION AND REMARKS						
529.4	529.4	31.1	1.4	4:34/1.0	(0.7)	(0.0)		(7.6)	(1.2)		Begin Coring @ 31.1 ft						
	528.0	32.5	5.0	1:13/0.4	50%	0%	RS-11	81%	13%		529.4	CRISTALLINE ROCK 31.1					
				2:37/1.0	(4.1)	(0.3)						Moderately Weathered, Brown-Gray, Medium Hard, (GRANODIORITE), with Very Close to Close Fracture Spacing					
525				3:38/1.0	82%	6%						RS-11: 33.0 - 33.4' Unit Weight: 166.2 pcf Unconfined Compressive Strength: 3,150 psi (453 ksf)					
	523.0	37.5		3:17/1.0													
			5.0	3:51/1.0	(4.6)	(2.7)											
				3:19/1.0	92%	54%											
520				3:21/1.0													
				3:35/1.0													
	518.0	42.5		5:30/1.0	(16.7)	(16.4)						520.0	GSI=20-25 40.5				
			5.0	7:10/1.0	98%	96%	RS-12					Fresh to Moderately Weathered, Gray, Hard, (GRANITE), with Very Close to Close Fracture Spacing					
515				4:22/1.0	(4.9)	(4.9)						RS-12: 42.4 - 42.8' Unit Weight: 174.8 pcf Unconfined Compressive Strength: 28,820 psi (4,151 ksf)					
				4:34/1.0	98%	98%											
	513.0	47.5		3:19/1.0													
			5.0	5:02/1.0	(5.0)	(4.9)											
				2:36/1.0	100%	98%											
510				3:13/1.0													
				2:56/1.0													
				2:20/1.0													
	508.0	52.5		3:32/1.0	(5.0)	(4.8)											
			5.0	3:49/1.0	100%	96%											
505				3:50/1.0													
				4:18/1.0													
				4:27/1.0													
	503.0	57.5		4:03/1.0													
				5:03/1.0							Boring Terminated at Elevation 503.0 ft In Crystalline Rock (GRANITE) 57.5						



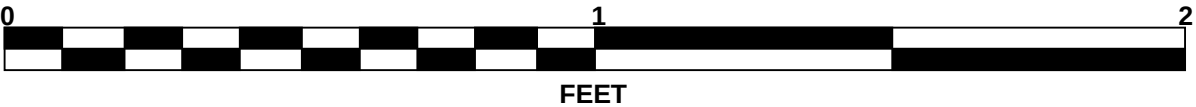
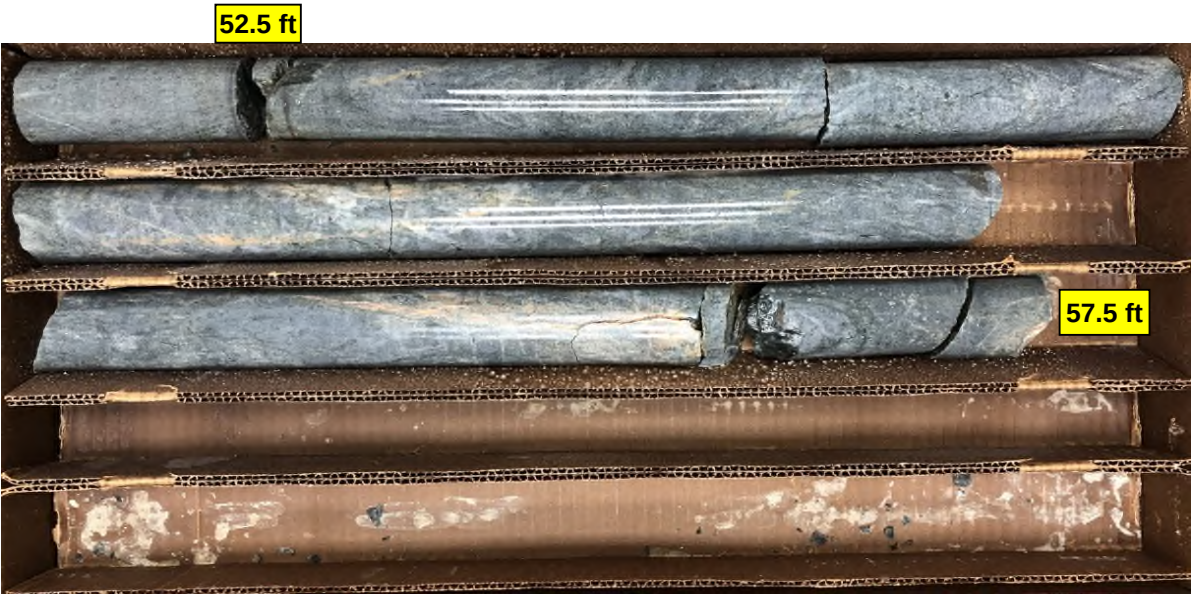
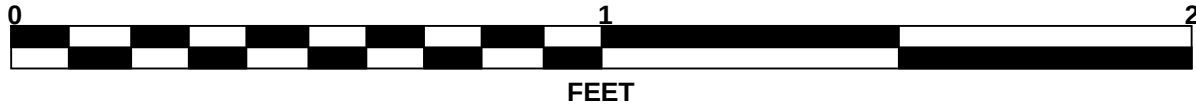
Replace Bridge No. 82 on US 29/74 over South Fork Catawba River

Rock Core Photographs

Boring - B2-C -L- Station , 32+48 11' LT

Box 1 & 2: 31.1 to 52.1 Feet

Box 3: 52.1 to 57.5 Feet



NCDOT BORE DOUBLE B-5857 U-6146 GEO_RDY BORINGS-WINDOWS-8ERUV72.GPJ NC DOT.GDT 11/15/20

WBS 48392.1.1				TIP U-6146				COUNTY GASTON				GEOLOGIST M. Brewer					
SITE DESCRIPTION Replace Bridge No. 82 on US 29/74 over South Fork Catawba River												GROUND WTR (ft)					
BORING NO. B3-A				STATION 33+38				OFFSET 61 ft LT				ALIGNMENT -L-				0 HR. N/A	
COLLAR ELEV. 563.4 ft				TOTAL DEPTH 71.0 ft				NORTHING 552,061				EASTING 1,381,208				24 HR. N/A	
DRILL RIG/HAMMER EFF./DATE MID0314 D-25 83% 02/28/2019								DRILL METHOD SPT Core Boring				HAMMER TYPE Automatic					
DRILLER B. Fowler				START DATE 05/14/19				COMP. DATE 05/15/19				SURFACE WATER DEPTH 3.8ft					
CORE SIZE NQ				TOTAL RUN 30.3 ft													
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) % RQD (ft) %		SAMP. NO.	STRATA REC. (ft) % RQD (ft) %		L O G	DESCRIPTION AND REMARKS						
515.7											Begin Coring @ 47.7 ft						
515	515.7	47.7	3.3	N=60/0.0 3:30/0.3 3:30/0.3 6:05/1.0 4:39/1.0	(2.9) 88%	(2.9) 88%	RS-13	(22.7) 97%	(21.5) 92%		515.7	CRYSTALLINE ROCK			47.7		
	512.4	51.0		4:20/1.0 5:36/1.0 7:37/1.0	(4.9) 98%	(4.9) 98%					Slightly Weathered to Fresh, Medium Hard to Hard, Gray-White-Black, (METAMORPHOSED QUARTZ DIORITE), with Very Close to Wide Fracture Spacing						
510			5.0	6:58/1.0 10:13/1.0			RS-14				RS-13: 47.7 - 48.5' Unit Weight: 178.1 pcf Unconfined Compressive Strength: 23,070 psi (3,321 ksf)						
	507.4	56.0		5:54/1.0 7:40/1.0 9:13/1.0 8:49/1.0 11:35/1.0	(5.0) 100%	(4.9) 98%					RS-14: 53.8 - 54.2' Unit Weight: 175.7 pcf Unconfined Compressive Strength: 11,210 psi (1,614 ksf)						
505			5.0	6:54/1.0 7:27/1.0 6:53/1.0 7:35/1.0	(4.9) 98%	(3.9) 78%					GSI=75-80						
	502.4	61.0		9:45/1.0													
500			5.0	4:31/1.0 6:26/1.0 6:48/1.0 7:15/1.0	(5.0) 100%	(4.9) 98%											
	497.4	66.0		9:17/1.0													
495			5.0														
	492.4	71.0										492.4	Boring Terminated at Elevation 492.4 ft In Crystalline Rock (METAMORPHOSED QUARTZ DIORITE)			71.0	

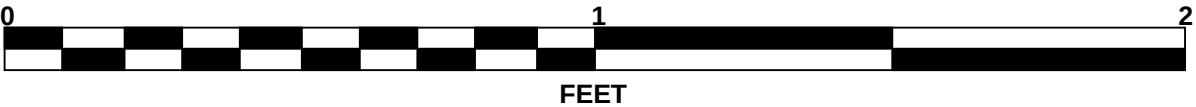
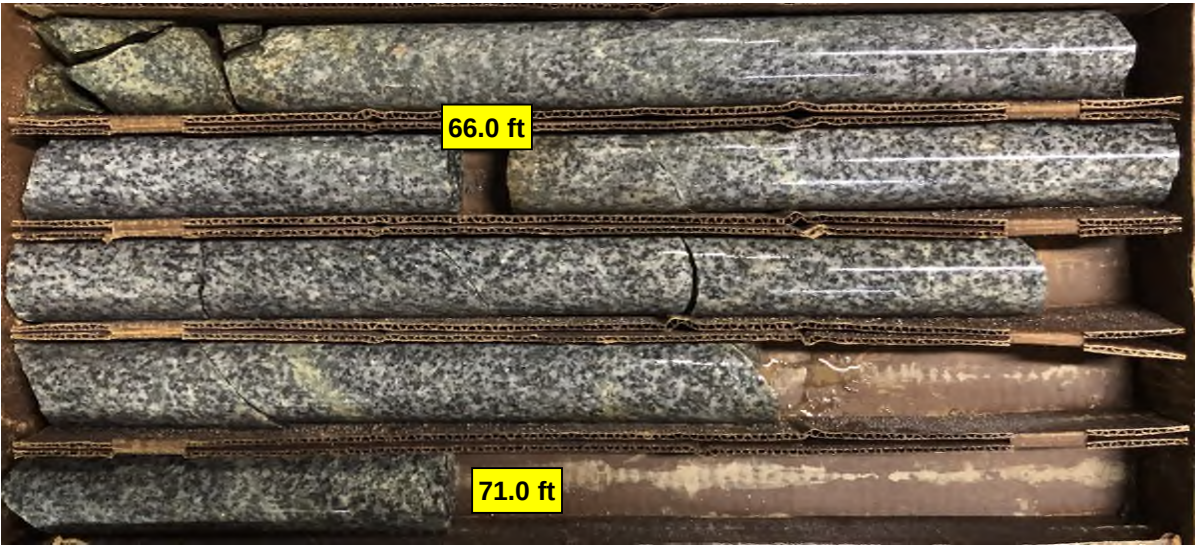
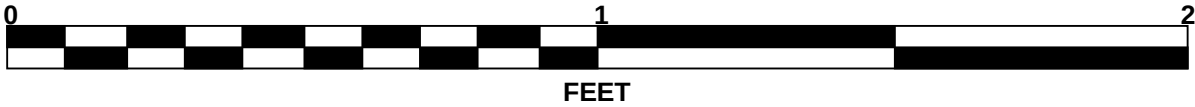
Replace Bridge No. 82 on US 29/74 over South Fork Catawba River

Rock Core Photographs

Boring - B3-A -L- Station 33+38, 61' LT

Box 1 & 2: 47.7 to 63.2 Feet

Box 3: 63.2 to 71.0 Feet



NC DOT BORE DOUBLE B-5857 U-6146 GEO RDY BORINGS-WINDOWS-8ERUV72.GPJ NC DOT.GDT 11/15/20

WBS 48392.1.1		TIP U-6146		COUNTY GASTON		GEOLOGIST M. Brewer						
SITE DESCRIPTION Replace Bridge No. 82 on US 29/74 over South Fork Catawba River							GROUND WTR (ft)					
BORING NO. B3-B		STATION 33+39		OFFSET 31 ft RT		ALIGNMENT -L-		0 HR. N/A				
COLLAR ELEV. 564.0 ft		TOTAL DEPTH 50.8 ft		NORTHING 551,973		EASTING 1,381,181		24 HR. N/A				
DRILL RIG/HAMMER EFF./DATE CG20446 Diedrich D50 89%/05/22/2019				DRILL METHOD NW Casing w/ Core			HAMMER TYPE Automatic					
DRILLER C. Odom		START DATE 07/22/19		COMP. DATE 07/23/19		SURFACE WATER DEPTH 4.2ft						
CORE SIZE NQ		TOTAL RUN 26.6 ft										
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) % ROD (ft) %		SAMP. NO.	STRATA REC. (ft) % ROD (ft) %		L O G	DESCRIPTION AND REMARKS	
539.8	539.8	24.2	1.6	N=60/0.0	(1.4)	(1.0)		(24.8)	(20.8)		Begin Coring @ 24.2 ft	
	538.2	25.8	5.0	8:18/1.0	88%	63%		93%	78%		539.8	CRISTALLINE ROCK 24.2
				3:39/0.6	(4.9)	(3.0)	RS-15					Slightly Weathered to Fresh, Hard, Gray-White-Blue, (GRANODIORITE), with Very Close to Moderately Close Fracture Spacing
				3:16/1.0	98%	60%						RS-15: 25.8 - 26.5' Unit Weight: 175.3 pcf Unconfined Compressive Strength: 23,260 psi (3,349 ksf)
535				5:13/1.0								RS-16: 31.9 - 32.6' Unit Weight: 192.1 pcf Unconfined Compressive Strength: 29,630 psi (4,266 ksf)
	533.2	30.8	5.0	3:52/1.0								GSI=60-65
				4:20/1.0			RS-16					
				3:39/1.0								
530				13:15/1.0	(4.7)	(4.2)						
				4:20/1.0	94%	84%						
				3:50/1.0								
	528.2	35.8	5.0	3:08/1.0								
				4:19/1.0								
				3:00/1.0	(4.0)	(3.4)						
				2:00/1.0	80%	68%						
				4:39/1.0								
525				4:18/1.0								
	523.2	40.8	5.0	3:08/1.0								
				3:34/1.0	(4.8)	(4.3)						
				4:13/1.0	96%	86%						
				4:52/1.0								
520				5:38/1.0								
	518.2	45.8	5.0	3:17/1.0								
				5:55/1.0	(5.0)	(4.9)						
				2:45/1.0	100%	98%						
				3:49/1.0								
515				3:58/1.0								
	513.2	50.8		4:33/1.0							513.2	
											Boring Terminated at Elevation 513.2 ft In Crystalline Rock (GRANODIORITE)	

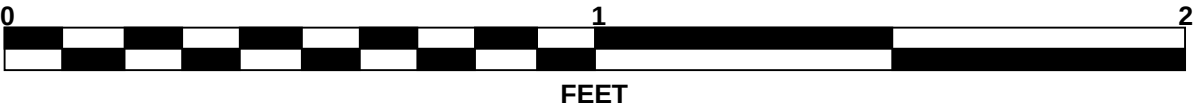
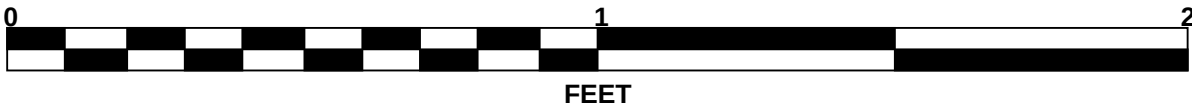
Replace Bridge No. 82 on US 29/74 over South Fork Catawba River

Rock Core Photographs

Boring - B3-B -L- Station 33+39, 31' RT

Box 1 & 2: 24.2 to 44.1 Feet

Box 3: 44.1 to 50.8 Feet



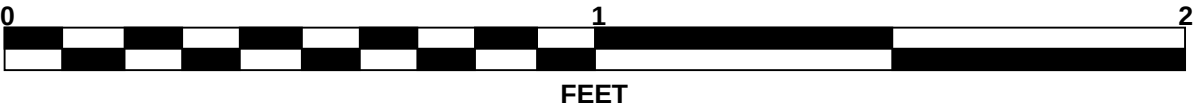
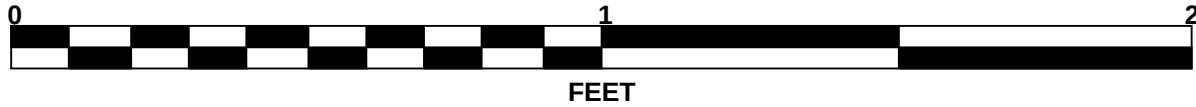
Replace Bridge No. 82 on US 29/74 over South Fork Catawba River

Rock Core Photographs

Boring - B3-C -L- Station 33+39, 12' LT

Box 1 & 2: 28.0 to 46.7 Feet

Box 3: 46.7 to 48.0 Feet



GEOTECHNICAL BORING REPORT
BORE LOG

WBS 48392.1.1		TIP U-6146		COUNTY GASTON		GEOLOGIST M. Brewer									
SITE DESCRIPTION Replace Bridge No. 82 on US 29/74 over South Fork Catawba River							GROUND WTR (ft)								
BORING NO. B4-A		STATION 34+36		OFFSET 69 ft LT		ALIGNMENT -L-		0 HR. N/A							
COLLAR ELEV. 573.6 ft		TOTAL DEPTH 64.4 ft		NORTHING 552,038		EASTING 1,381,304		24 HR. 5.0							
DRILL RIGHAMMER EFF./DATE CG20446 Diedrich D50 89%05/22/2019				DRILL METHOD NW Casing w/ Core			HAMMER TYPE Automatic								
DRILLER C. Odom			START DATE 07/01/19		COMP. DATE 07/01/19		SURFACE WATER DEPTH N/A								
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				ELEV. (ft)	DEPTH (ft)
575															
	573.6	0.0												GROUND SURFACE 0.0	
			1	1	2							M		ALLUVIAL	
570	570.1	3.5	WOH	WOH	WOH							M		Very Soft to Soft, Brown, Fine Sandy SILT (A-4), with trace mica and roots	
	567.1	6.5	WOH	WOH	WOH										
565			WOH	WOH	WOH							Sat.		566.6 Very Loose, Gray, Clayey Fine to Coarse SAND (A-2-6), with trace gravel and roots 7.0	
	562.1	11.5	WOH	WOH	WOH									563.6 Very Soft, Gray-Brown, Fine Sandy CLAY (A-6) 10.0	
560			WOH	WOH	WOH							Sat.			
	557.1	16.5	WOH	WOH	3									558.6 Soft, Brown, Fine Sandy SILT (A-4), with trace mica 15.0	
555												Sat.			
	552.1	21.5	4	6	5									553.6 RESIDUAL 20.0	
550												W		Stiff to Very Stiff, Brown-White-Orange, Fine to Coarse Sandy SILT (A-4), with trace gravel-sized rock fragments	
	547.1	26.5	7	13	12										
545												M			
	542.1	31.5	5	9	11										
540												M			
	537.1	36.5	100/0.3											537.1 36.5	
535														WEATHERED ROCK	
	532.1	41.5	60/0.0											Brown, (METAMORPHOSED QUARTZ DIORITE)	
530												RS-19		CRYSTALLINE ROCK	
														Gray-White-Black, (METAMORPHOSED QUARTZ DIORITE)	
														REC=97% RQD=81% GSI=60-65	
525															
												RS-20			
520															
515															
510														509.2 64.4	
														Boring Terminated at Elevation 509.2 ft In Crystalline Rock (METAMORPHOSED QUARTZ DIORITE)	

WBS 48392.1.1				TIP U-6146				COUNTY GASTON				GEOLOGIST M. Brewer										
SITE DESCRIPTION Replace Bridge No. 82 on US 29/74 over South Fork Catawba River												GROUND WTR (ft)										
BORING NO. B4-A				STATION 34+36				OFFSET 69 ft LT				ALIGNMENT -L-				0 HR. N/A						
COLLAR ELEV. 573.6 ft				TOTAL DEPTH 64.4 ft				NORTHING 552,038				EASTING 1,381,304				24 HR. 5.0						
DRILL RIG/HAMMER EFF./DATE CG20446 Diedrich D50 89%05/22/2019								DRILL METHOD NW Casing w/ Core				HAMMER TYPE Automatic										
DRILLER C. Odom				START DATE 07/01/19				COMP. DATE 07/01/19				SURFACE WATER DEPTH N/A										
CORE SIZE NQ				TOTAL RUN 22.9 ft																		
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN		SAMP. NO.	STRATA		L O G	DESCRIPTION AND REMARKS											
					REC. (ft) %	RQD (ft) %		REC. (ft) %	RQD (ft) %													
532.1											Begin Coring @ 41.5 ft											
530	532.1	41.5	2.9	N=60/0.0 2:31/9.0 2:11/1.0 1:50/1.0	(2.9) 100%	(2.0) 69%		(22.3) 97%	(18.5) 81%		41.5											
	529.2	44.4									CRISTALLINE ROCK Slightly Weathered to Fresh, Gray-White-Black, Hard, (METAMORPHOSED QUARTZ DIORITE), with Very Close to Moderately Close Fracture Spacing											
525			5.0	1:42/1.0 1:57/1.0 2:40/1.0 2:16/1.0 2:42/1.0	(4.8) 96%	(3.9) 78%	RS-19				RS-19: 43.5 - 44.4' Unit Weight: 176.3 pcf Unconfined Compressive Strength: 5,470 psi (788 ksf)											
	524.2	49.4									RS-20: 53.9 - 54.4' Unit Weight: 178.2 pcf Unconfined Compressive Strength: 19,350 psi (2,786 ksf)											
520			5.0	2:43/1.0 2:20/1.0 1:51/1.0 2:11/1.0 2:34/1.0	(5.0) 100%	(3.3) 66%					GSI=60-65											
	519.2	54.4					RS-20															
515			5.0	1:31/1.0 2:15/1.0 2:25/1.0 2:27/1.0 3:13/1.0	(5.0) 100%	(5.0) 100%																
	514.2	59.4																				
510			5.0	2:46/1.0 3:05/1.0 2:40/1.0 2:43/1.0 3:52/1.0	(4.6) 92%	(4.3) 86%																
	509.2	64.4									509.2											
											Boring Terminated at Elevation 509.2 ft In Crystalline Rock (METAMORPHOSED QUARTZ DIORITE)											

NCDOT BORE DOUBLE B-5857_U-6146_GEO_RDY BORINGS-WINDOWS-8ERUV72.GPJ NC_DOT.GDT 11/15/20

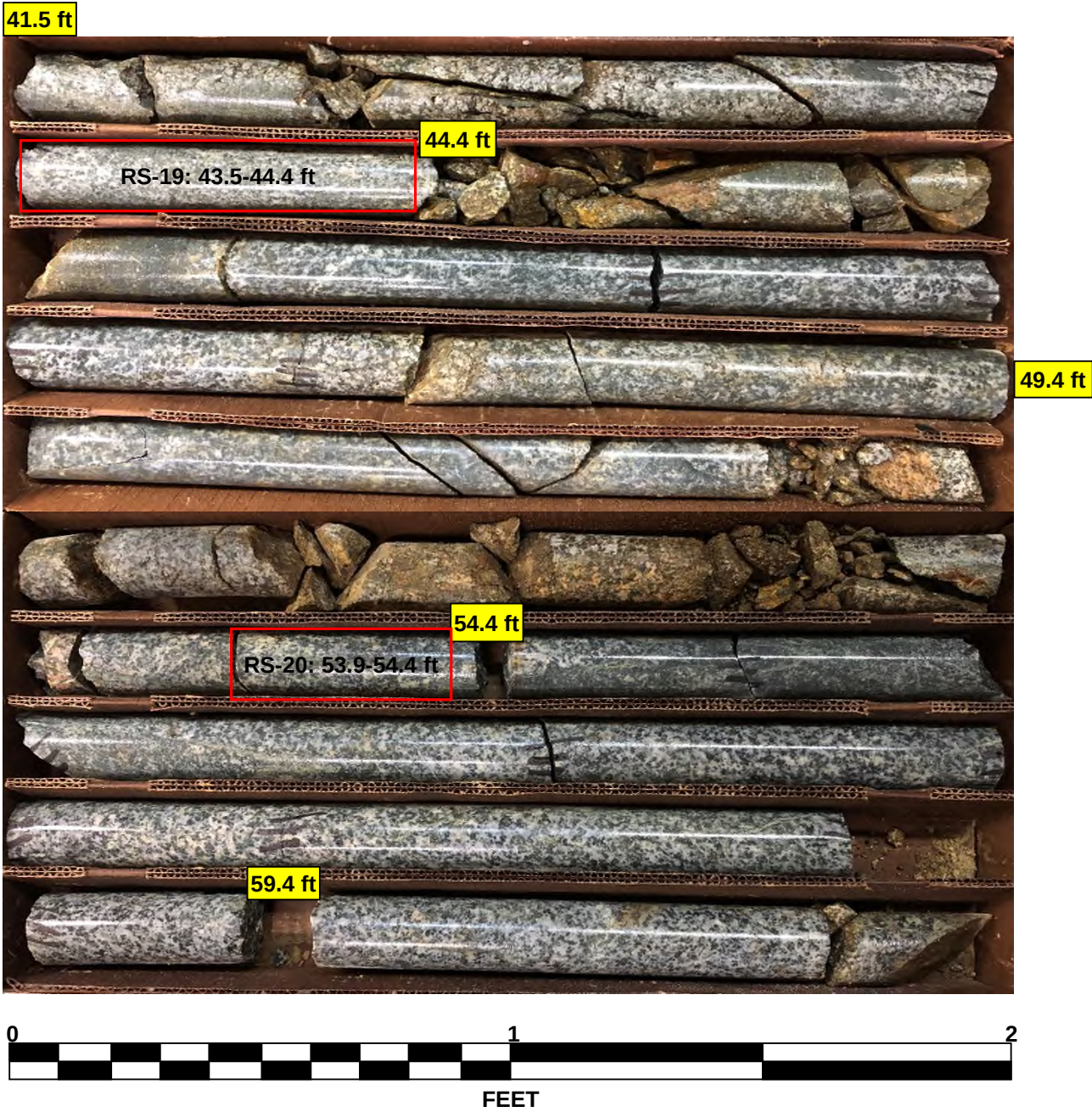
Replace Bridge No. 82 on US 29/74 over South Fork Catawba River

Rock Core Photographs

Boring - B4-A -L- Station 34+36, 69' LT

Box 1 & 2: 41.5 to 60.7 Feet

Box 3: 60.7 to 64.4 Feet



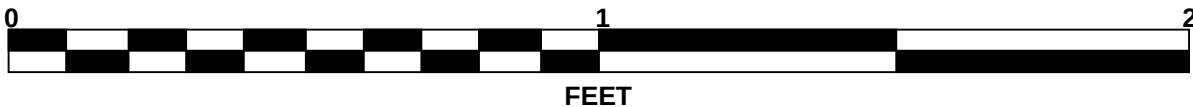
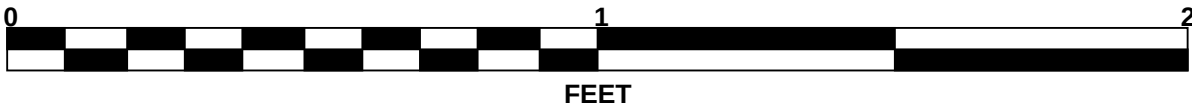
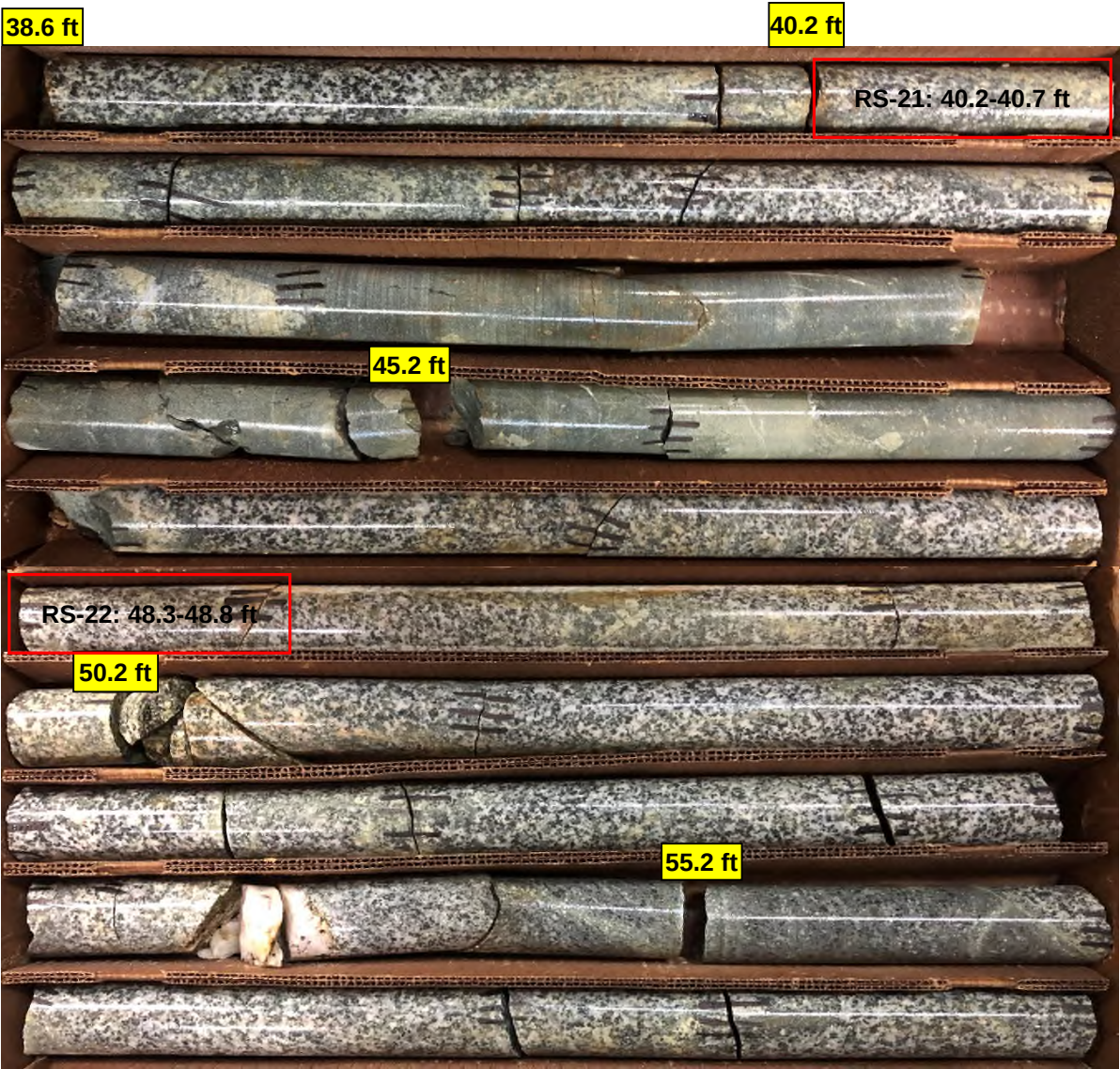
Replace Bridge No. 82 on US 29/74 over South Fork Catawba River

Rock Core Photographs

Boring - B4-B -L- Station 34+34, 37' RT

Box 1 & 2: 38.6 to 57.6 Feet

Box 3: 57.6 to 60.2 Feet



NC DOT BORE DOUBLE B-5857 U-6146 GEO RDY BORINGS-WINDOWS-8ERUV72.GPJ NC DOT.GDT 11/15/20

WBS 48392.1.1				TIP U-6146		COUNTY GASTON		GEOLOGIST M. Brewer				
SITE DESCRIPTION Replace Bridge No. 82 on US 29/74 over South Fork Catawba River								GROUND WTR (ft)				
BORING NO. B4-C				STATION 34+33		OFFSET 23 ft LT		ALIGNMENT -L-		0 HR. N/A		
COLLAR ELEV. 573.5 ft				TOTAL DEPTH 74.8 ft		NORTHING 551,995		EASTING 1,381,287		24 HR. 4.5		
DRILL RIG/HAMMER EFF./DATE CG20446 Diedrich D50 89%05/22/2019						DRILL METHOD NW Casing w/ Core			HAMMER TYPE Automatic			
DRILLER C. Odom				START DATE 07/02/19		COMP. DATE 07/09/19		SURFACE WATER DEPTH N/A				
CORE SIZE NQ				TOTAL RUN 31.7 ft								
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	REC. (ft) %	RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	RQD (ft) %	L O G	DESCRIPTION AND REMARKS	
530.4	530.4	43.1	1.7	N=60/0.0	(1.3)	(0.0)		(14.8)	(4.6)		Begin Coring @ 43.1 ft	
	528.7	44.8	5.0	4:15/1.0	76%	0%		89%	28%		530.4	CRYSTALLINE ROCK
				2:40/0.7								Fresh to Moderately Severely Weathered, Moderately Hard to Hard, Gray-Brown-White, (METAMORPHOSED QUARTZ DIORITE), with Very Close to Close Fracture Spacing
				3:17/1.0	(4.6)	(0.6)						
525				3:15/1.0	92%	12%						
	523.7	49.8		4:10/1.0								RS-23: 52.8 - 53.5'
				5:11/1.0								Unit Weight: 177.3 pcf
				6:45/1.0								Unconfined Compressive Strength: 5,260 psi (757 ksf)
520			5.0	10:17/1.0	(3.9)	(2.5)						GSI=25-30
				5:38/1.0	78%	50%						
				3:15/1.0			RS-23					
	518.7	54.8		4:03/1.0								
				3:22/1.0								
515			5.0	2:46/1.0	(5.0)	(1.5)						
				2:49/1.0	100%	30%						
				2:54/1.0								
	513.7	59.8		2:07/1.0							513.7	
				3:11/1.0								
510			5.0	2:49/1.0	(5.0)	(4.4)		(14.8)	(13.1)		Fresh to Moderately Weathered, Hard, Gray-White, (METAMORPHOSED QUARTZ DIORITE), with Close to Moderately Close Fracture Spacing	
				2:52/1.0	100%	88%		99%	87%			
				2:00/1.0							RS-24: 63.5 - 64.3'	
	508.7	64.8		2:42/1.0			RS-24				Unit Weight: 177.6 pcf	
				3:29/1.0							Unconfined Compressive Strength: 7,310 psi (1,053 ksf)	
505			5.0	2:52/1.0	(5.0)	(5.0)					GSI=70-75	
				3:06/1.0	100%	100%						
				3:15/1.0								
	503.7	69.8		3:25/1.0								
				3:46/1.0								
500			5.0	1:52/1.0	(4.8)	(3.7)						
				2:52/1.0	96%	74%						
				3:40/1.0								
	498.7	74.8		3:54/1.0							498.7	
				2:31/1.0							Boring Terminated at Elevation 498.7 ft In Crystalline Rock (METAMORPHOSED QUARTZ DIORITE)	

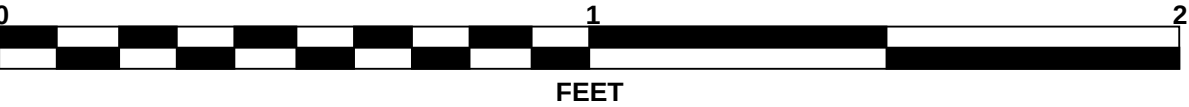
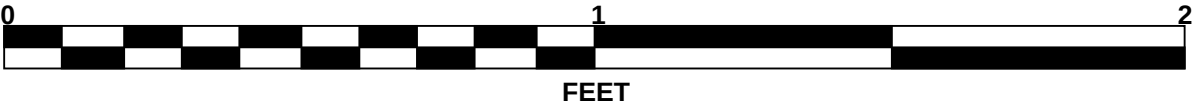
Replace Bridge No. 82 on US 29/74 over South Fork Catawba River

Rock Core Photographs

Boring - B4-C -L- Station 34+33, 23' LT

Box 1 & 2: 43.1 to 61.3 Feet

Box 3 & 4: 61.3 to 74.8 Feet



NC DOT BORE DOUBLE B-5857 U-6146 GEO RDY BORINGS-WINDOWS-8ERUV72.GPJ NC DOT.GDT 11/15/20

WBS 48392.1.1		TIP U-6146		COUNTY GASTON		GEOLOGIST M. Brewer								
SITE DESCRIPTION Replace Bridge No. 82 on US 29/74 over South Fork Catawba River							GROUND WTR (ft)							
BORING NO. EB2-B		STATION 35+21		OFFSET 39 ft RT		ALIGNMENT -L-		0 HR. 17.0						
COLLAR ELEV. 585.6 ft		TOTAL DEPTH 60.0 ft		NORTHING 551,909		EASTING 1,381,351		24 HR. 16.6						
DRILL RIG/HAMMER EFF./DATE CG20446 Diedrich D50 89%/05/22/2019				DRILL METHOD H.S. Augers			HAMMER TYPE Automatic							
DRILLER C. Odum		START DATE 07/19/19		COMP. DATE 07/19/19		SURFACE WATER DEPTH N/A								
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				
590														
585	584.6	1.0	4	4	3	7								585.6 GROUND SURFACE 0.0
580	582.1	3.5	2	2	1	3								582.6 ROADWAY EMBANKMENT 3.0
	577.1	8.5	WOH	WOH	WOH	0								582.6 Medium Stiff, Red-Tan, Silty CLAY (A-7-5), with trace asphalt fragments 3.0
575														Very Soft to Soft, Red-Tan, Fine Sandy SILT (A-4), with trace mica
570	572.1	13.5	1	1	2	3								573.6 Soft, Brown-Orange-Black-Red, Silty CLAY (A-7-5), with trace mica 12.0
	567.1	18.5	3	2	4	6								568.6 ALLUVIAL 17.0
565	562.1	23.5	2	5	8	13								Medium Stiff to Stiff, Red-Orange, Silty CLAY (A-7-5)
560	557.1	28.5	2	3	4	7								558.6 Medium Stiff, Tan-Red-Gray, Fine Sandy CLAY (A-6) 27.0
	552.1	33.5	7	8	6	14								553.6 RESIDUAL 32.0
550	547.1	38.5	2	6	9	15								Stiff to Hard, Brown-White, Fine Sandy SILT (A-4)
545	542.1	43.5	5	9	26	35								
	537.1	48.5	21	12	44	56								
540	532.1	53.5	44	54	46/0.3									
535	527.1	58.5	100/0.2											531.6 WEATHERED ROCK 54.0
	525.6	60.0	60/0.0											Gray-Brown-White (METAMORPHOSED QUARTZ DIORITE)
530														525.6 Boring Terminated with Standard Penetration Test Refusal at Elevation 525.6 ft On Crystalline Rock (METAMORPHOSED QUARTZ DIORITE)

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 48392.1.1			TIP U-6146			COUNTY GASTON			GEOLOGIST C. Keeten					
SITE DESCRIPTION Replace Bridge No. 82 on US 29/74 over South Fork Catawba River									GROUND WTR (ft)					
BORING NO. EB2-C			STATION 35+16			OFFSET 16 ft LT			ALIGNMENT -L-			0 HR. N/A		
COLLAR ELEV. 587.1 ft			TOTAL DEPTH 58.6 ft			NORTHING 551,963			EASTING 1,381,364			24 HR. 18.0		
DRILL RIG/HAMMER EFF./DATE CG20446 Diedrich D50 89%/05/22/2019						DRILL METHOD NW Casing w/ Advancer			HAMMER TYPE Automatic					
DRILLER C. Odom			START DATE 07/17/19			COMP. DATE 07/17/19			SURFACE WATER DEPTH N/A					
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100			ELEV. (ft)	DEPTH (ft)
590														
585	585.6	1.5	3	1	2								587.1	GROUND SURFACE 0.0
	583.6	3.5	WOH	2	2								585.6	0.6' ABC and 0.9' Asphalt 1.5
														ROADWAY EMBANKMENT
														Very Soft to Soft, Red-Brown, Silty CLAY (A-7-5), with trace mica
580														
	578.6	8.5	1	1	1									
575														
	573.6	13.5	2	1	2									
570													570.1	ALLUVIAL 17.0
	568.6	18.5	WOH	2	2									Soft to Medium Stiff, Brown, Fine Sandy CLAY (A-6), with trace mica
565														
	563.6	23.5	3	2	4									
560													560.1	Loose, Brown, Silty Fine SAND (A-2-4), with trace mica 27.0
	558.6	28.5	3	4	4									
555														
	553.6	33.5	4	14	27									
550													553.1	RESIDUAL 34.0
	548.6	38.5	16	23	33									Hard, Tan-Brown, Fine Sandy SILT (A-4), with trace mica
545														
	543.6	43.5	37	38	37									
540														
	538.6	48.5	23	30	55									
535														
	533.6	53.5	55	45/0.3									533.6	WEATHERED ROCK 53.5
														Gray-White-Brown, (METAMORPHOSED QUARTZ DIORITE)
530														
	528.6	58.5	60/0.1										528.6	58.5
													528.5	CRYSTALLINE ROCK 58.5
														(METAMORPHOSED QUARTZ DIORITE)
														Boring Terminated with Standard Penetration Test Refusal at Elevation 528.5 ft in Crystalline Rock (METAMORPHOSED QUARTZ DIORITE)

NCDOT BORE DOUBLE B-5857_U-6146_GEO_RDY BORINGS-WINDOWS-8ERUV72.GPJ NC_DOT.GDT 11/15/20

SOIL TEST RESULTS															
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
ST-1	66' LT	35+25 -L-	2.0 - 4.0'	A-6(9)	39	11	10.3	18.3	38.4	33.0	99.0	93.5	71.4	35.9	-

ROCK TEST RESULTS							
SAMPLE NO.	BORING	STATION	OFFSET	DEPTH INTERVAL	ROCK TYPE	UNIT WEIGHT (PCF)	UNCONFINED COMPRESSIVE STRENGTH
RS-1	B1-A	31+53 -L-	61' LT	49.1 - 49.9'	GRANODIORITE	174.4	7,880 psi /1,135 ksf
RS-2	B1-A	31+53 -L-	61' LT	61.2 - 62.0'	GRANODIORITE	170.5	1,420 psi /205 ksf
RS-3	B1-B	31+53 -L-	40' RT	41.1 - 42.0'	GRANODIORITE	170.5	9,260 psi /1,333 ksf
RS-4	B1-B	31+53 -L-	40' RT	49.4 - 50.2'	GRANODIORITE	165.0	2,780 psi /400 ksf
RS-5	B1-C	31+50 -L-	16' LT	54.4 - 55.0'	GRANODIORITE	168.7	4,090 psi /588 ksf
RS-6	B1-C	31+50 -L-	16' LT	58.2 - 58.9'	GRANODIORITE	172.7	5,700 psi /821 ksf
RS-7	B2-A	32+48 -L-	61' LT	38.2 - 39.2'	GRANODIORITE	169.2	16,470 psi /2,371 ksf
RS-8	B2-A	32+48 -L-	61' LT	46.8 - 47.9'	GRANODIORITE	169.2	10,240 psi /1,474 ksf
RS-9	B2-B	32+48 -L-	32' RT	28.2 - 28.6'	GRANODIORITE	176.6	6,310 psi /909 ksf
RS-10	B2-B	32+48 -L-	32' RT	36.5 - 37.0'	GRANODIORITE	174.6	7,160 psi /1,031 ksf
RS-11	B2-C	32+48 -L-	11' LT	33.0 - 33.4'	GRANODIORITE	166.2	3,150 psi /453 ksf
RS-12	B2-C	32+48 -L-	11' LT	42.4 - 42.8'	GRANITE	174.8	28,820 psi /4,151 ksf
RS-13	B3-A	33+38 -L-	61' LT	47.7 - 48.5'	METAMORPHOSED QUARTZ DIORITE	178.1	23,070 psi /3,321 ksf
RS-14	B3-A	33+38 -L-	61' LT	53.8 - 54.2'	METAMORPHOSED QUARTZ DIORITE	175.7	11,210 psi /1,614 ksf
RS-15	B3-B	33+39 -L-	31' RT	25.8 - 26.5'	GRANODIORITE	175.3	23,260 psi /3,349 ksf
RS-16	B3-B	33+39 -L-	31' RT	31.9 - 32.6'	GRANODIORITE	192.1	29,630 psi /4,266 ksf
RS-17	B3-C	33+39 -L-	12' LT	30.9 - 31.7'	GRANODIORITE	179.9	12,090 psi /1,741 ksf
RS-18	B3-C	33+39 -L-	12' LT	35.0 - 35.6'	GRANODIORITE	177.7	29,220 psi /4,208 ksf
RS-19	B4-A	34+36 -L-	69' LT	43.5 - 44.4'	METAMORPHOSED QUARTZ DIORITE	176.3	5,470 psi /788 ksf
RS-20	B4-A	34+36 -L-	69' LT	53.9 - 54.4'	METAMORPHOSED QUARTZ DIORITE	178.2	19,350 psi /2,786 ksf
RS-21	B4-B	34+34 -L-	37' RT	40.2 - 40.7'	METAMORPHOSED QUARTZ DIORITE	181.8	15,980 psi /2,300 ksf
RS-22	B4-B	34+34 -L-	37' RT	48.3 - 48.8'	METAMORPHOSED QUARTZ DIORITE	178.7	16,950 psi /2,441 ksf
RS-23	B4-C	34+33 -L-	23' LT	52.8 - 53.5'	METAMORPHOSED QUARTZ DIORITE	177.3	5,260 psi /757 ksf
RS-24	B4-C	34+33 -L-	23' LT	63.5 - 64.3'	METAMORPHOSED QUARTZ DIORITE	177.6	7,310 psi /1,053 ksf

LAB TESTING PERFORMED BY NCDOT LAB CERT NO.126-0910 : DOUG DeESCH - 126-01-0910



Photo #1: Existing Bridge 82 on US 29 /74 over South Fork Catawba River looking west (downstation)



Photo #2: Existing Bridge 82 on US 29 /74 over South Fork Catawba River looking upstream



Photo #3: Existing Bridge 82 on US 29 /74 over South Fork Catawba River looking downstream

PROJECT: 48392

REFERENCE: U-6146

CONTENTS

SHEET NO.	DESCRIPTION
1	TITLE SHEET
2	LEGEND (SOIL & ROCK)
3	SITE PLAN AND WALL ENVELOPE
4-6	BORE LOGS

STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

GEOTECHNICAL ENGINEERING UNIT

STRUCTURE

SUBSURFACE INVESTIGATION

COUNTY GASTON

PROJECT DESCRIPTION US 29/US74 (WILKINSON BLVD)
FROM SR 2209 (WESLEYAN DR/MARKET ST) TO
SR 2016/SR 2017 (GEORGIA BELLE AVE/HUBBARD
ST) AND BRIDGE #350082 OVER SOUTH FORK
CATAWBA RIVER

SITE DESCRIPTION RETAINING WALL NO. 4:
MECHANICALLY STABILIZED EARTH (MSE) WALL
ON -L- FROM 47+90 RT TO 51+60 RT

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	U-6146	1	6

CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF STUDY, PLANNING AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. THE VARIOUS FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N.C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT, AT (919) 707-6850. THE SUBSURFACE PLANS AND REPORTS, FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA ARE NOT PART OF THE CONTRACT.

GENERAL SOIL AND ROCK STRATA DESCRIPTIONS AND INDICATED BOUNDARIES ARE BASED ON A GEOTECHNICAL INTERPRETATION OF ALL AVAILABLE SUBSURFACE DATA AND MAY NOT NECESSARILY REFLECT THE ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS OR BETWEEN SAMPLED STRATA WITHIN THE BOREHOLE. THE LABORATORY SAMPLE DATA AND THE IN SITU (IN-PLACE) TEST DATA CAN BE RELIED ON ONLY TO THE DEGREE OF RELIABILITY INHERENT IN THE STANDARD TEST METHOD. THE OBSERVED WATER LEVELS OR SOIL MOISTURE CONDITIONS INDICATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOIL MOISTURE CONDITIONS MAY VARY CONSIDERABLY WITH TIME ACCORDING TO CLIMATIC CONDITIONS INCLUDING TEMPERATURES, PRECIPITATION AND WIND, AS WELL AS OTHER NON-CLIMATIC FACTORS.

THE BIDDER OR CONTRACTOR IS CAUTIONED THAT DETAILS SHOWN ON THE SUBSURFACE PLANS ARE PRELIMINARY ONLY AND IN MANY CASES THE FINAL DESIGN DETAILS ARE DIFFERENT. FOR BIDDING AND CONSTRUCTION PURPOSES, REFER TO THE CONSTRUCTION PLANS AND DOCUMENTS FOR FINAL DESIGN INFORMATION ON THIS PROJECT. THE DEPARTMENT DOES NOT WARRANT OR GUARANTEE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION MADE, NOR THE INTERPRETATIONS MADE, OR OPINION OF THE DEPARTMENT AS TO THE TYPE OF MATERIALS AND CONDITIONS TO BE ENCOUNTERED. THE BIDDER OR CONTRACTOR IS CAUTIONED TO MAKE SUCH INDEPENDENT SUBSURFACE INVESTIGATIONS AS HE DEEMS NECESSARY TO SATISFY HIMSELF AS TO CONDITIONS TO BE ENCOUNTERED ON THE PROJECT. THE CONTRACTOR SHALL HAVE NO CLAIM FOR ADDITIONAL COMPENSATION OR FOR AN EXTENSION OF TIME FOR ANY REASON RESULTING FROM THE ACTUAL CONDITIONS ENCOUNTERED AT THE SITE DIFFERING FROM THOSE INDICATED IN THE SUBSURFACE INFORMATION.

- NOTES:
- THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N.C. DEPARTMENT OF TRANSPORTATION AS ACCURATE NOR IS IT CONSIDERED PART OF THE PLANS, SPECIFICATIONS OR CONTRACT FOR THE PROJECT.
 - BY HAVING REQUESTED THIS INFORMATION, THE CONTRACTOR SPECIFICALLY WAIVES ANY CLAIMS FOR INCREASED COMPENSATION OR EXTENSION OF TIME BASED ON DIFFERENCES BETWEEN THE CONDITIONS INDICATED HEREIN AND THE ACTUAL CONDITIONS AT THE PROJECT SITE.

PERSONNEL

M. BREWER

C. ODOM

ITHIR TESTING

D. UNDERWOOD

INVESTIGATED BY CG2

DRAWN BY M. BREWER, P.E.

CHECKED BY R. KRAL, P.E.

SUBMITTED BY M. BREWER, P.E.

DATE MARCH 2020

Prepared in the Office of:



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DocuSigned by:

D. Matthew Brewer 3/16/2020

386129C0A4C1462... SIGNATURE DATE

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NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION

SOIL IS CONSIDERED UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO THE STANDARD PENETRATION TEST (AASHTO T 206, ASTM D1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. FOR EXAMPLE, *VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6*

SOIL LEGEND AND AASHTO CLASSIFICATION

GENERAL CLASS.	GRANULAR MATERIALS (≤ 35% PASSING #200)						SILT-CLAY MATERIALS (> 35% PASSING #200)						ORGANIC MATERIALS					
GROUP CLASS.	A-1		A-3		A-2		A-4		A-5		A-6		A-7		A-1, A-2		A-4, A-5	
SYMBOL	A-1-a	A-1-b	A-2-4		A-2-5		A-2-6		A-2-7		A-4		A-5		A-6		A-7	
% PASSING #10 #40 #200	50 MX 30 MX 15 MX	50 MX 25 MX	51 MN	35 MX	35 MX	35 MX	35 MX	35 MX	36 MN	36 MN	36 MN	36 MN	36 MN	36 MN	36 MN	GRANULAR SOILS	SILT-CLAY SOILS	MUCK, PEAT
MATERIAL PASSING #40 LL PI	— 6 MX		— NP		40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	40 MX 10 MX	41 MN 11 MN	40 MX 10 MX	41 MN 11 MN	40 MX 11 MN	41 MN 11 MN	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER	HIGHLY ORGANIC SOILS		
GROUP INDEX	0		0		0		4 MX		8 MX		12 MX		16 MX		NO MX			
USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS. GRAVEL, AND SAND		FINE SAND		SILTY OR CLAYEY GRAVEL AND SAND				SILTY SOILS		CLAYEY SOILS							
GEN. RATING AS SUBGRADE	EXCELLENT TO GOOD						FAIR TO POOR						FAIR TO POOR		POOR		UNSUITABLE	

PI OF A-7-5 SUBGROUP IS ≤ LL - 30; PI OF A-7-6 SUBGROUP IS > LL - 30

CONSISTENCY OR DENSENESS

PRIMARY SOIL TYPE	COMPACTNESS OR CONSISTENCY	RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE)	RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT ²)
GENERALLY GRANULAR MATERIAL (NON-COHESIVE)	VERY LOOSE LOOSE MEDIUM DENSE DENSE VERY DENSE	< 4 4 TO 10 10 TO 30 30 TO 50 > 50	N/A
GENERALLY SILT-CLAY MATERIAL (COHESIVE)	VERY SOFT SOFT MEDIUM STIFF STIFF VERY STIFF HARD	< 2 2 TO 4 4 TO 8 8 TO 15 15 TO 30 > 30	< 0.25 0.25 TO 0.5 0.5 TO 1.0 1 TO 2 2 TO 4 > 4

TEXTURE OR GRAIN SIZE

U.S. STD. SIEVE SIZE OPENING (MM)	4	10	40	60	200	270
	4.75	2.00	0.42	0.25	0.075	0.053
BOULDER (BLDR.)						
COBBLE (COB.)						
GRAVEL (GR.)						
COARSE SAND (CSE. SD.)						
FINE SAND (F SD.)						
SILT (SL.)						
CLAY (CL.)						

GRAIN SIZE: 305 IN. 75 12 3 2.0 0.25 0.05 0.005

SOIL MOISTURE - CORRELATION OF TERMS

SOIL MOISTURE SCALE (ATTERBERG LIMITS)	FIELD MOISTURE DESCRIPTION	GUIDE FOR FIELD MOISTURE DESCRIPTION
LL PL OM SL	LIQUID LIMIT	- SATURATED - (SAT.) USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE
	PLASTIC LIMIT	- WET - (W) SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE
	OPTIMUM MOISTURE SHRINKAGE LIMIT	- MOIST - (M) SOLID; AT OR NEAR OPTIMUM MOISTURE
		- DRY - (D) REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE

PLASTICITY

	PLASTICITY INDEX (PI)	DRY STRENGTH
NON PLASTIC	0-5	VERY LOW
SLIGHTLY PLASTIC	6-15	SLIGHT
MODERATELY PLASTIC	16-25	MEDIUM
HIGHLY PLASTIC	26 OR MORE	HIGH

COLOR

DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY). MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.

GRADATION

WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE.
UNIFORMLY GRADED - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE.
GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES OF TWO OR MORE SIZES.

ANGULARITY OF GRAINS

THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS:
ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.

MINERALOGICAL COMPOSITION

MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.

COMPRESSIBILITY

SLIGHTLY COMPRESSIBLE	LL < 31
MODERATELY COMPRESSIBLE	LL = 31 - 50
HIGHLY COMPRESSIBLE	LL > 50

PERCENTAGE OF MATERIAL

ORGANIC MATERIAL	GRANULAR SOILS	SILT - CLAY SOILS	OTHER MATERIAL
TRACE OF ORGANIC MATTER	2 - 3%	3 - 5%	TRACE
LITTLE ORGANIC MATTER	3 - 5%	5 - 12%	LITTLE
MODERATELY ORGANIC	5 - 10%	12 - 20%	SOME
HIGHLY ORGANIC	> 10%	> 20%	HIGHLY

GROUND WATER

▽

WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING

▽

STATIC WATER LEVEL AFTER 24 HOURS

▽PW

PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA

○

SPRING OR SEEP

MISCELLANEOUS SYMBOLS

ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION

SOIL SYMBOL

ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT

INFERRED SOIL BOUNDARY

INFERRED ROCK LINE

ALLUVIAL SOIL BOUNDARY

25/025

DIP & DIP DIRECTION OF ROCK STRUCTURES

SPT DMT VST PMT

AUGER BORING

CORE BORING

MONITORING WELL

PIEZOMETER INSTALLATION

SLOPE INDICATOR INSTALLATION

CONE PENETROMETER TEST

SOUNDING ROD

TEST BORING WITH CORE

SPT N-VALUE

RECOMMENDATION SYMBOLS

UNDERCUT

SHALLOW UNDERCUT

UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE

UNCLASSIFIED EXCAVATION - ACCEPTABLE DEGRADABLE ROCK

UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE USED IN THE TOP 3 FEET OF EMBANKMENT OR BACKFILL

ABBREVIATIONS

AR - AUGER REFUSAL
BT - BORING TERMINATED
CL - CLAY
CPT - CONE PENETRATION TEST
CSE - COARSE
DMT - DILATOMETER TEST
DPT - DYNAMIC PENETRATION TEST
e - VOID RATIO
F - FINE
FOSS - FOSSILIFEROUS
FRAC - FRACTURED, FRACTURES
FRAGS - FRAGMENTS
HL - HIGHLY

MED. - MEDIUM
MICA - MICACEOUS
MOD. - MODERATELY
NP - NON PLASTIC
ORG. - ORGANIC
PMT - PRESSUREMETER TEST
SAP. - SAPROLITIC
SD. - SAND, SANDY
SL. - SILT, SILTY
SLI. - SLIGHTLY
TCR - TRICONE REFUSAL
w - MOISTURE CONTENT
V - VERY

VST - VANE SHEAR TEST
WEA. - WEATHERED
γ - UNIT WEIGHT
γ_d - DRY UNIT WEIGHT

SAMPLE ABBREVIATIONS
S - BULK
SS - SPLIT SPOON
ST - SHELBY TUBE
RS - ROCK
RT - RECOMPACTED TRIAXIAL
CBR - CALIFORNIA BEARING RATIO

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
☐ CME-45C
☐ CME-55
☐ CME-550
☐ VANE SHEAR TEST
☐ PORTABLE HOIST
☒ DIEDRICH D50
☐

ADVANCING TOOLS:
☐ CLAY BITS
☐ 6" CONTINUOUS FLIGHT AUGER
☒ 8" HOLLOW AUGERS
☐ HARD FACED FINGER BITS
☐ TUNG-CARBIDE INSERTS
☐ CASING ☐ W/ ADVANCER
☐ TRICONE ☐ STEEL TEETH
☐ TRICONE ☐ TUNG-CARB.
☐ CORE BIT
☐

HAMMER TYPE:
☒ AUTOMATIC ☐ MANUAL

CORE SIZE:
☐ -B ☐ -H ☐ -N

HAND TOOLS:
☐ POST HOLE DIGGER
☐ HAND AUGER
☐ SOUNDING ROD
☐ VANE SHEAR TEST
☐

ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT REFUSAL IF TESTED. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS IN NON-COASTAL PLAIN MATERIAL. THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK. ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:

WEATHERED ROCK (WR)

CRYSTALLINE ROCK (CR)

NON-CRYSTALLINE ROCK (NCR)

COASTAL PLAIN SEDIMENTARY ROCK (CP)

NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.
FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.
FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.
COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.

WEATHERING

FRESH
VERY SLIGHT (V SLI.)
SLIGHT (SLI.)
MODERATE (MOD.)
MODERATELY SEVERE (MOD. SEV.)
SEVERE (SEV.)
VERY SEVERE (V SEV.)
COMPLETE

ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE.
ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN. CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE.
ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.
SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK.
ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. *IF TESTED, WOULD YIELD SPT REFUSAL*
ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. *IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF*
ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. *IF TESTED, WOULD YIELD SPT N VALUES < 100 BPF*
ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.

ROCK HARDNESS

VERY HARD
HARD
MODERATELY HARD
MEDIUM HARD
SOFT
VERY SOFT

CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.
CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.
CAN BE SCRATCHED BY KNIFE OR PICK, GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.
CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PIECES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.
CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.
CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.

FRACTURE SPACING

TERM
VERY WIDE
WIDE
MODERATELY CLOSE
CLOSE
VERY CLOSE

SPACING
MORE THAN 10 FEET
3 TO 10 FEET
1 TO 3 FEET
0.16 TO 1 FOOT
LESS THAN 0.16 FEET

BEDDING

TERM
VERY THICKLY BEDDED
THICKLY BEDDED
THINLY BEDDED
VERY THINLY BEDDED
THICKLY LAMINATED
THINLY LAMINATED

THICKNESS
4 FEET
1.5 - 4 FEET
0.16 - 1.5 FEET
0.03 - 0.16 FEET
0.008 - 0.03 FEET
< 0.008 FEET

INDURATION

FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.
FRIABLE
MODERATELY INDURATED
INDURATED
EXTREMELY INDURATED

IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.
GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.
GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.
GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.
SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.

TERMS AND DEFINITIONS

ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.
AQUIFER - A WATER BEARING FORMATION OR STRATA.
ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.
ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, SUCH AS SHALE, SLATE, ETC.
ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE.
CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.
COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.
CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.
DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.
DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.
DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.
FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.
FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.
FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLOOGED FROM PARENT MATERIAL.
FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.
FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.
JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.
LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.
LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.
MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.
PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.
RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.
ROCK QUALITY DESIGNATION (ROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.
SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.
SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.
SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.
STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.
STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.
STRATA ROCK QUALITY DESIGNATION (SROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.
TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.

BENCH MARK: N/A

ELEVATION: FEET

NOTES:
SURVEY AND ROADWAY DESIGN FILES PROVIDED BY TGS ENGINEERS
ON 12/05/2019

DATE: 8-15-14

8/17/99

RETAINING WALL NO. 4:

PROJECT REFERENCE NO.
U-6146

SHEET NO.
3

R/W SHEET NO.

ROADWAY DESIGN ENGINEER

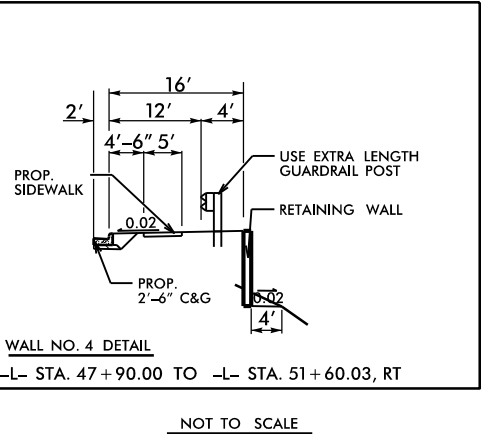
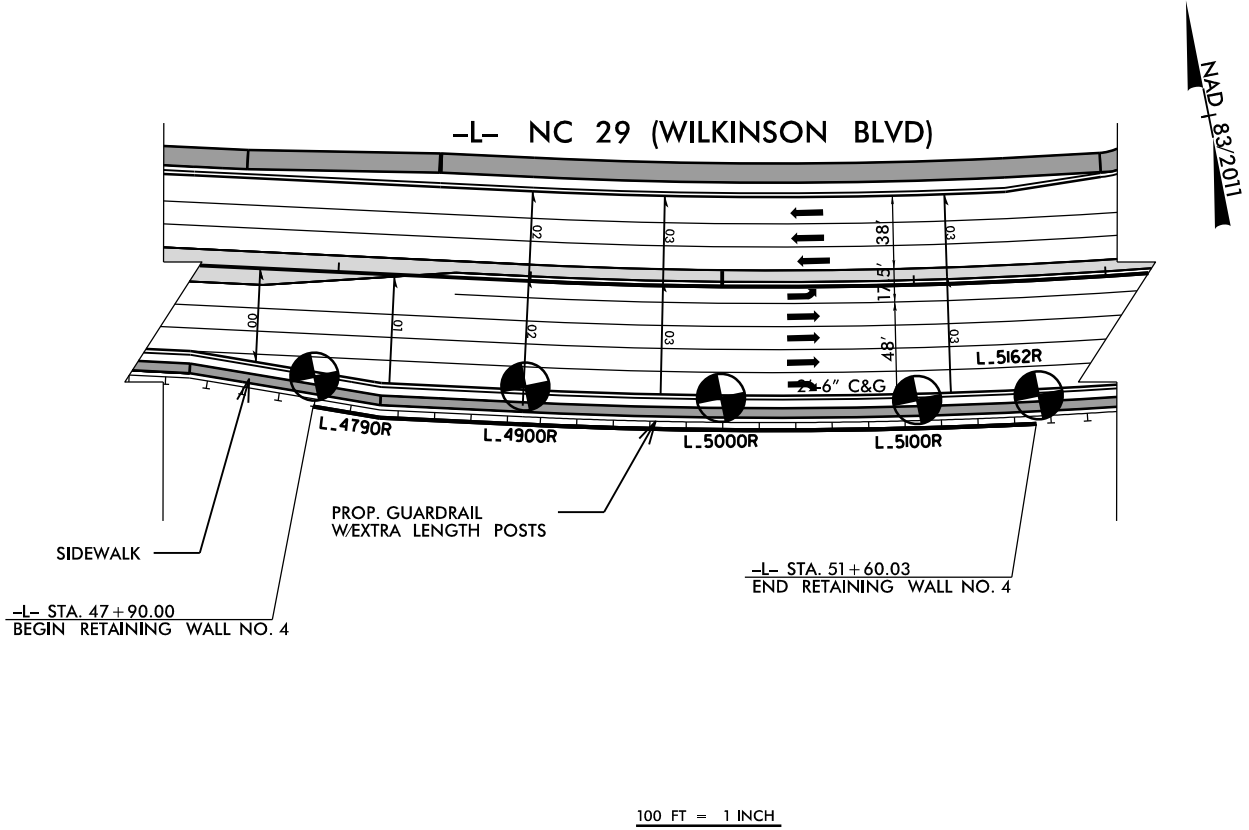
HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED

TGS ENGINEERS

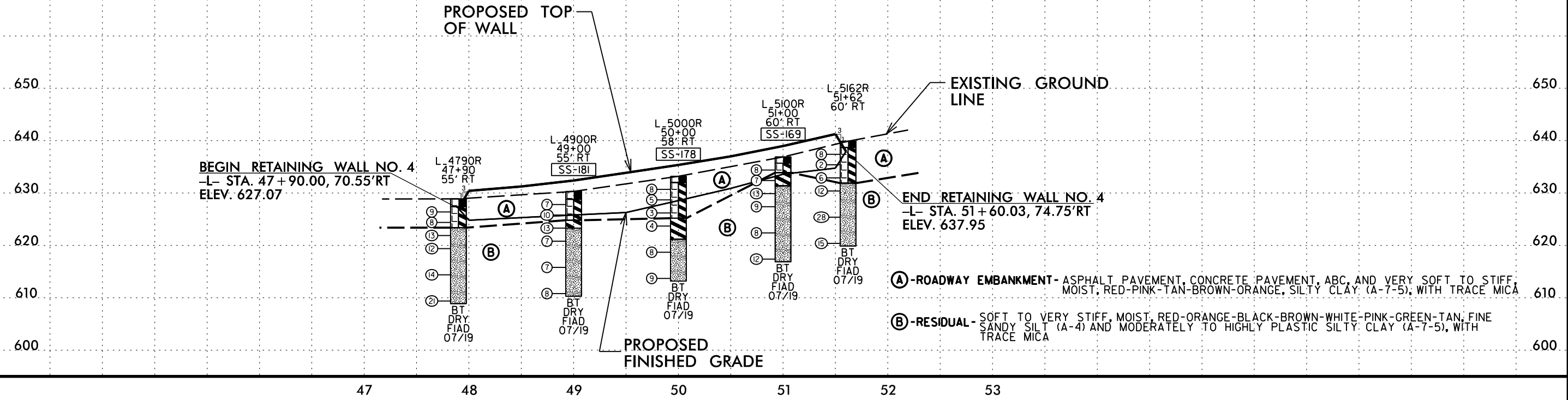
804-C N. LAFAYETTE ST
SHELBY, NC 28150
PH (704) 476-0003
CORP. LICENSE NO.: C-0275



THE WALL ENVELOPE DOES NOT ACCURATELY
DEPICT THE ACTUAL FACE OF THE WALL
AT THE FOLLOWING LOCATION:
-L- STA. 47+90.00 TO 48+50.00, RT

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS-181	55' RT	49+00 -L-	6.0 - 7.5'	A-7-5(11)	48	18	18.1	17.5	25.8	38.6	97.0	86.0	65.8	23.4	-
SS-178	58' RT	50+00 -L-	13.5 - 15.0'	A-4(0)	33	0	23.5	32.0	30.8	13.7	98.0	83.0	47.8	20.0	-
SS-169	60' RT	51+00 -L-	3.5 - 5.0'	A-7-5(28)	65	33	8.0	16.2	25.1	50.7	99.0	95.0	77.3	29.0	-



GEOTECHNICAL BORING REPORT
BORE LOG

WBS 48392.1.1			TIP U-6146			COUNTY GASTON			GEOLOGIST M. Brewer							
SITE DESCRIPTION Retaining Wall No. 4 on -L- from 47+90 RT to 51+60 RT									GROUND WTR (ft)							
BORING NO. L_5000R			STATION 50+00			OFFSET 58 ft RT			ALIGNMENT -L-							
COLLAR ELEV. 633.2 ft			TOTAL DEPTH 20.0 ft			NORTHING 551,482			EASTING 1,382,773							
DRILL RIG/HAMMER EFF./DATE CG20446 Diedrich D50 89%/05/22/2019						DRILL METHOD H.S. Augers			HAMMER TYPE Automatic							
DRILLER C. Odom			START DATE 07/19/19			COMP. DATE 07/19/19			SURFACE WATER DEPTH N/A							
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				ELEV. (ft)	DEPTH (ft)	
635																
630	631.7	1.5												633.2	GROUND SURFACE	0.0
	629.7	3.5	5	4	4									632.0	Asphalt (1.2 ft)	1.2
	627.2	6.0	2	2	3									ROADWAY EMBANKMENT		
625	624.7	8.5	2	1	2									Soft to Medium Stiff, Red-Pink-Tan, Silty CLAY (A-7-5), with trace mica		
														625.2	RESIDUAL	8.0
620	619.7	13.5	2	2	2									Soft, Red, Silty CLAY (A-7-5)		
														621.2	Medium Stiff to Stiff, Red-Orange-Tan, Fine Sandy SILT (A-4(0)), with trace mica	12.0
615	614.7	18.5	4	4	4						SS-178	20%				
			4	5	4									613.2	Boring Terminated at Elevation 613.2 ft In Residual Fine Sandy SILT (A-4)	20.0

WBS 48392.1.1			TIP U-6146			COUNTY GASTON			GEOLOGIST M. Brewer					
SITE DESCRIPTION Retaining Wall No. 4 on -L- from 47+90 RT to 51+60 RT									GROUND WTR (ft)					
BORING NO. L_5100R			STATION 51+00			OFFSET 60 ft RT			ALIGNMENT -L-					
COLLAR ELEV. 636.9 ft			TOTAL DEPTH 20.0 ft			NORTHING 551,461			EASTING 1,382,872					
DRILL RIG/HAMMER EFF./DATE CG20446 Diedrich D50 89%/05/22/2019						DRILL METHOD H.S. Augers			HAMMER TYPE Automatic					
DRILLER C. Odom			START DATE 07/19/19			COMP. DATE 07/19/19			SURFACE WATER DEPTH N/A					
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				
640														
635	635.4	1.5												636.9 GROUND SURFACE 0.0
														635.7 Asphalt (1.2 ft) 1.2
630	633.4	3.5	3	4	4									633.9 ROADWAY EMBANKMENT 3.0
			2	3	4									Medium Stiff, Red-Brown, Silty CLAY (A-7-5), with trace mica
625	630.9	6.0	4	6	7						SS-169	29%		631.4 RESIDUAL 5.5
			4	6	7									Medium Stiff, Red, Silty CLAY (A-7-5(28)), with trace mica
620	628.4	8.5	4	4	5									Medium Stiff to Stiff, Red-Orange-Tan, Fine Sandy SILT (A-4), with trace mica
616.9	623.4	13.5	3	4	4									
616.9	618.4	18.5	3	6	6									
Boring Terminated at Elevation 616.9 ft In Residual Fine Sandy SILT (A-4)														

NCDOT BORE DOUBLE B-5857_U-6146_GEO_RDY_BORINGS.GPJ NC_DOT.GDT 17/20

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 48392.1.1			TIP U-6146			COUNTY GASTON			GEOLOGIST M. Brewer						
SITE DESCRIPTION Retaining Wall No. 4 on -L- from 47+90 RT to 51+60 RT									GROUND WTR (ft)						
BORING NO. L_5162R			STATION 51+62			OFFSET 60 ft RT			ALIGNMENT -L-						
COLLAR ELEV. 639.9 ft			TOTAL DEPTH 20.0 ft			NORTHING 551,451			EASTING 1,382,935						
DRILL RIGHAMMER EFF./DATE CG20446 Diedrich D50 89%05/22/2019						DRILL METHOD H.S. Augers			HAMMER TYPE Automatic						
DRILLER C. Odom			START DATE 07/19/19			COMP. DATE 07/19/19			SURFACE WATER DEPTH N/A						
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				ELEV. (ft)	DEPTH (ft)
640														639.9	GROUND SURFACE 0.0
635	638.4	1.5	4	4	4									638.7	Asphalt (1.2 ft) 1.2
	636.4	3.5	1	1	1									ROADWAY EMBANKMENT	
	633.9	6.0	1	2	4									Very Soft to Medium Stiff, Red-Orange-Brown, Moderately Plastic Silty CLAY (A-7-5), with trace mica	
630	631.4	8.5	2	5	7									631.9	8.0
														RESIDUAL	
625	626.4	13.5	8	16	12									Stiff to Very Stiff, Tan-Pink-Red-Brown-White, Fine Sandy SILT (A-4), with trace mica	
620	621.4	18.5	5	7	8									619.9	20.0
														Boring Terminated at Elevation 619.9 ft In Residual Fine Sandy SILT (A-4)	

NCDOT BORE DOUBLE B-5857_U-6146_GEO_RDY_BORINGS.GPJ NC_DOT.GDT 17/20

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION

SOIL IS CONSIDERED UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO THE STANDARD PENETRATION TEST (AASHTO T 206, ASTM D1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. FOR EXAMPLE, *VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6*

SOIL LEGEND AND AASHTO CLASSIFICATION

GENERAL CLASS.	GRANULAR MATERIALS (≤ 35% PASSING #200)						SILT-CLAY MATERIALS (> 35% PASSING #200)						ORGANIC MATERIALS					
GROUP CLASS.	A-1		A-3		A-2		A-4		A-5		A-6		A-7		A-1, A-2		A-4, A-5	
SYMBOL	A-1-a	A-1-b	A-2-4		A-2-5		A-2-6		A-2-7		A-4		A-5		A-6		A-7	
% PASSING #10 #40 #200	50 MX 30 MX 15 MX	50 MX 25 MX	51 MN	35 MX	35 MX	35 MX	35 MX	35 MX	36 MN	36 MN	36 MN	36 MN	36 MN	36 MN	36 MN	GRANULAR SOILS	SILT-CLAY SOILS	MUCK, PEAT
MATERIAL PASSING #40 LL PI	— 6 MX		— NP		40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	40 MX 10 MX	41 MN 11 MN	40 MX 10 MX	41 MN 11 MN	40 MX 11 MN	41 MN 11 MN	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER	HIGHLY ORGANIC SOILS		
GROUP INDEX	0		0		0		4 MX		8 MX		12 MX		16 MX		NO MX			
USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS. GRAVEL, AND SAND		FINE SAND		SILTY OR CLAYEY GRAVEL AND SAND				SILTY SOILS		CLAYEY SOILS							
GEN. RATING AS SUBGRADE	EXCELLENT TO GOOD						FAIR TO POOR						FAIR TO POOR		POOR		UNSUITABLE	

PI OF A-7-5 SUBGROUP IS ≤ LL - 30; PI OF A-7-6 SUBGROUP IS > LL - 30

CONSISTENCY OR DENSENESS

PRIMARY SOIL TYPE	COMPACTNESS OR CONSISTENCY	RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE)	RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT ²)
GENERALLY GRANULAR MATERIAL (NON-COHESIVE)	VERY LOOSE LOOSE MEDIUM DENSE DENSE VERY DENSE	< 4 4 TO 10 10 TO 30 30 TO 50 > 50	N/A
GENERALLY SILT-CLAY MATERIAL (COHESIVE)	VERY SOFT SOFT MEDIUM STIFF STIFF VERY STIFF HARD	< 2 2 TO 4 4 TO 8 8 TO 15 15 TO 30 > 30	< 0.25 0.25 TO 0.5 0.5 TO 1.0 1 TO 2 2 TO 4 > 4

TEXTURE OR GRAIN SIZE

U.S. STD. SIEVE SIZE OPENING (MM)	4	10	40	60	200	270
	4.75	2.00	0.42	0.25	0.075	0.053
BOULDER (BLDR.)						
COBBLE (COB.)						
GRAVEL (GR.)						
COARSE SAND (CSE. SD.)						
FINE SAND (F SD.)						
SILT (SL.)						
CLAY (CL.)						

GRAIN SIZE: 305 IN. 75 12 3 2.0 0.25 0.05 0.005

SOIL MOISTURE - CORRELATION OF TERMS

SOIL MOISTURE SCALE (ATTERBERG LIMITS)	FIELD MOISTURE DESCRIPTION	GUIDE FOR FIELD MOISTURE DESCRIPTION
LL PL OM SL	LIQUID LIMIT	- SATURATED - (SAT.) USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE
	PLASTIC LIMIT	- WET - (W) SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE
	OPTIMUM MOISTURE SHRINKAGE LIMIT	- MOIST - (M) SOLID; AT OR NEAR OPTIMUM MOISTURE
		- DRY - (D) REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE

PLASTICITY

	PLASTICITY INDEX (PI)	DRY STRENGTH
NON PLASTIC	0-5	VERY LOW
SLIGHTLY PLASTIC	6-15	SLIGHT
MODERATELY PLASTIC	16-25	MEDIUM
HIGHLY PLASTIC	26 OR MORE	HIGH

COLOR

DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY). MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.

GRADATION

WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE.
UNIFORMLY GRADED - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE.
GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES OF TWO OR MORE SIZES.

ANGULARITY OF GRAINS

THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.

MINERALOGICAL COMPOSITION

MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.

COMPRESSIBILITY

SLIGHTLY COMPRESSIBLE LL < 31
MODERATELY COMPRESSIBLE LL = 31 - 50
HIGHLY COMPRESSIBLE LL > 50

PERCENTAGE OF MATERIAL

ORGANIC MATERIAL	GRANULAR SOILS	SILT - CLAY SOILS	OTHER MATERIAL
TRACE OF ORGANIC MATTER	2 - 3%	3 - 5%	TRACE
LITTLE ORGANIC MATTER	3 - 5%	5 - 12%	LITTLE
MODERATELY ORGANIC	5 - 10%	12 - 20%	SOME
HIGHLY ORGANIC	> 10%	> 20%	HIGHLY

GROUND WATER

▽

WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING

▽

STATIC WATER LEVEL AFTER 24 HOURS

▽PW

PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA

○

SPRING OR SEEP

MISCELLANEOUS SYMBOLS

ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION

SOIL SYMBOL

ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT

INFERRED SOIL BOUNDARY

INFERRED ROCK LINE

ALLUVIAL SOIL BOUNDARY

25/025

DIP & DIP DIRECTION OF ROCK STRUCTURES

SPT DMT VST PMT

TEST BORING

AUGER BORING

CORE BORING

MONITORING WELL

PIEZOMETER INSTALLATION

SLOPE INDICATOR INSTALLATION

CONE PENETROMETER TEST

SOUNDING ROD

TEST BORING WITH CORE

SPT N-VALUE

RECOMMENDATION SYMBOLS

UNDERCUT

SHALLOW UNDERCUT

UNCLASSIFIED EXCAVATION - ACCEPTABLE WASTE

UNCLASSIFIED EXCAVATION - ACCEPTABLE DEGRADABLE ROCK

UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE USED IN THE TOP 3 FEET OF EMBANKMENT OR BACKFILL

ABBREVIATIONS

AR - AUGER REFUSAL
BT - BORING TERMINATED
CL - CLAY
CPT - CONE PENETRATION TEST
CSE - COARSE
DMT - DILATOMETER TEST
DPT - DYNAMIC PENETRATION TEST
e - VOID RATIO
F - FINE
FOSS - FOSSILIFEROUS
FRAC - FRACTURED, FRACTURES
FRAGS - FRAGMENTS
HL - HIGHLY

MED. - MEDIUM
MICA - MICACEOUS
MOD. - MODERATELY
NP - NON PLASTIC
ORG. - ORGANIC
PMT - PRESSUREMETER TEST
SAP. - SAPROLITIC
SD. - SAND, SANDY
SL. - SILT, SILTY
SLI. - SLIGHTLY
TCR - TRICONE REFUSAL
w - MOISTURE CONTENT
V - VERY

VST - VANE SHEAR TEST
WEA. - WEATHERED
γ - UNIT WEIGHT
γ_d - DRY UNIT WEIGHT

SAMPLE ABBREVIATIONS
S - BULK
SS - SPLIT SPOON
ST - SHELBY TUBE
RS - ROCK
RT - RECOMPACTED TRIAXIAL
CBR - CALIFORNIA BEARING RATIO

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
☐ CME-45C
☐ CME-55
☐ CME-550
☐ VANE SHEAR TEST
☐ PORTABLE HOIST
☒ DIEDRICH D50
☐

ADVANCING TOOLS:
☐ CLAY BITS
☐ 6" CONTINUOUS FLIGHT AUGER
☒ 8" HOLLOW AUGERS
☐ HARD FACED FINGER BITS
☐ TUNG-CARBIDE INSERTS
☐ CASING ☐ W/ ADVANCER
☐ TRICONE ☐ STEEL TEETH
☐ TRICONE ☐ TUNG-CARB.
☐ CORE BIT
☐

HAMMER TYPE:
☒ AUTOMATIC ☐ MANUAL

CORE SIZE:
☐ -B ☐ -H ☐ -N

HAND TOOLS:
☐ POST HOLE DIGGER
☐ HAND AUGER
☐ SOUNDING ROD
☐ VANE SHEAR TEST
☐

ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT REFUSAL IF TESTED. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS IN NON-COASTAL PLAIN MATERIAL. THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK. ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:

WEATHERED ROCK (WR)

CRYSTALLINE ROCK (CR)

NON-CRYSTALLINE ROCK (NCR)

COASTAL PLAIN SEDIMENTARY ROCK (CP)

NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.

FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.

FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.

COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.

WEATHERING

FRESH
VERY SLIGHT (V SLI.)
SLIGHT (SLI.)
MODERATE (MOD.)
MODERATELY SEVERE (MOD. SEV.)
SEVERE (SEV.)
VERY SEVERE (V SEV.)
COMPLETE

ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE.
ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN. CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE.
ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.
SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK.
ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. *IF TESTED, WOULD YIELD SPT REFUSAL*
ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. *IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF*
ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. *IF TESTED, WOULD YIELD SPT N VALUES < 100 BPF*
ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.

TERMS AND DEFINITIONS

ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.
AQUIFER - A WATER BEARING FORMATION OR STRATA.
ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.
ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, SUCH AS SHALE, SLATE, ETC.
ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE.
CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.
COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.
CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.
DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.
DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.
DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.
FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.
FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.
FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLOGGED FROM PARENT MATERIAL.
FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.
FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.
JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.
LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.
LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.
MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.
PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.
RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.
ROCK QUALITY DESIGNATION (RQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.
SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.
SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.
SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.
STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.
STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.
STRATA ROCK QUALITY DESIGNATION (SROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.
TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.

BENCH MARK: N/A

ELEVATION: FEET

NOTES:
SURVEY AND ROADWAY DESIGN FILES PROVIDED BY TGS ENGINEERS
ON 12/05/2019

INDURATION

FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.

FRIABLE

MODERATELY INDURATED

INDURATED

EXTREMELY INDURATED

IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.

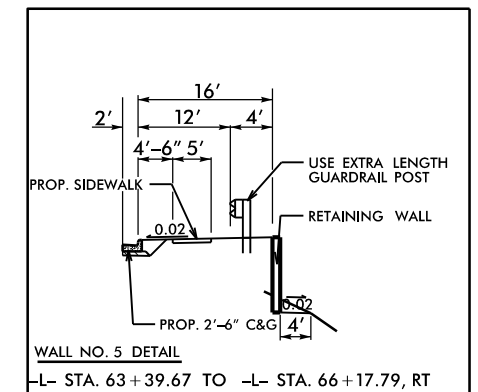
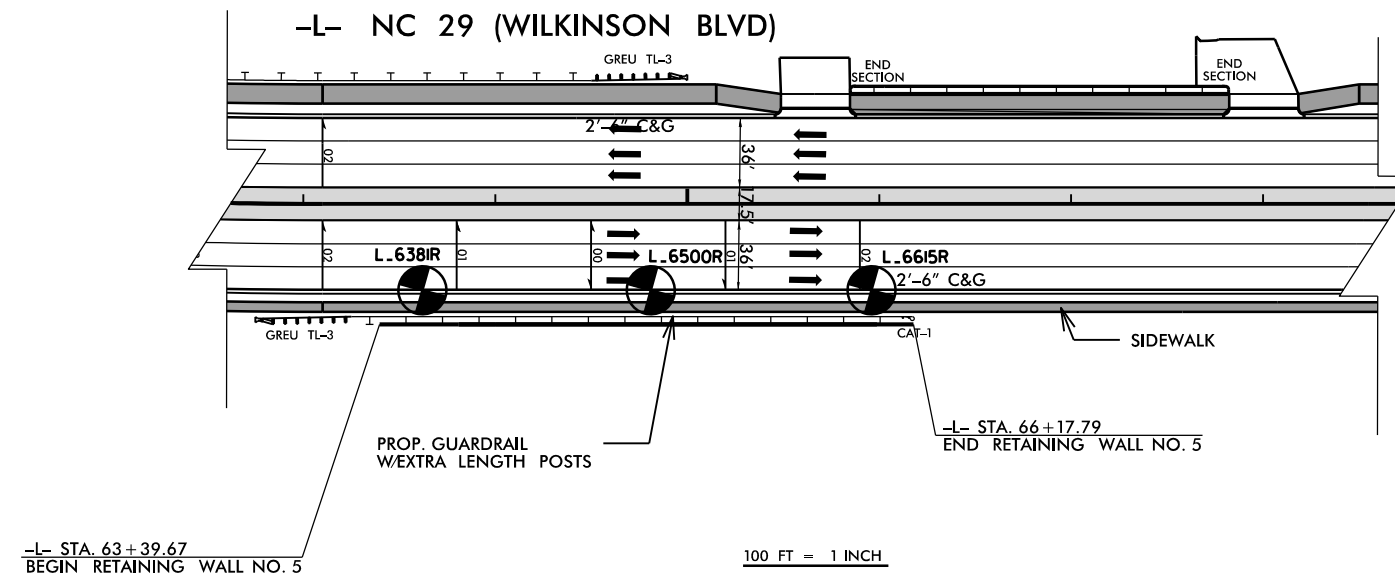
GRASS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.

GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.

SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.

DATE: 8-15-14

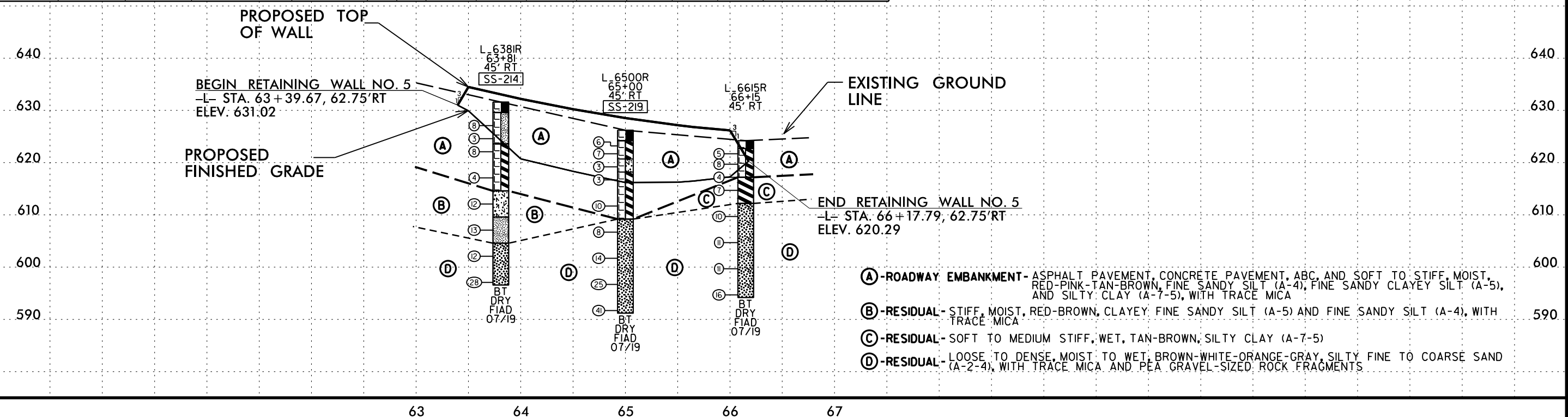
RETAINING WALL NO. 5:



TYPICAL SECTION
NOT TO SCALE

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS-214	45' RT	63+81 -L-	13.5 - 15.0'	A-7-5(14)	54	20	16.6	18.2	23.0	42.2	98.0	88.0	67.0	25.9	-
SS-219	45' RT	65+00 -L-	6.0 - 7.5'	A-5(3)	49	3	27.5	17.1	29.5	25.9	99.0	80.0	57.7	32.8	-



GEOTECHNICAL BORING REPORT

BORE LOG

WBS 48392.1.1		TIP U-6146		COUNTY GASTON		GEOLOGIST M. Brewer									
SITE DESCRIPTION Retaining Wall No. 5 on -L- from 63+39 RT to 66+17 RT							GROUND WTR (ft)								
BORING NO. L_6615R		STATION 66+15		OFFSET 45 ft RT		ALIGNMENT -L-		0 HR. 26.0							
COLLAR ELEV. 624.2 ft		TOTAL DEPTH 30.0 ft		NORTHING 551,619		EASTING 1,384,387		24 HR. FIAD							
DRILL RIG/HAMMER EFF./DATE CG20446 Diedrich D50 89%/05/22/2019				DRILL METHOD H.S. Augers			HAMMER TYPE Automatic								
DRILLER C. Odom		START DATE 07/24/19		COMP. DATE 07/24/19		SURFACE WATER DEPTH N/A									
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				ELEV. (ft)	DEPTH (ft)
625															
	622.7	1.5	5	2	3									624.2	GROUND SURFACE 0.0
	620.7	3.5	3	3	5									622.7	Asphalt (0.5 ft) and ABC (1.0 ft) 1.5
620														ROADWAY EMBANKMENT	
	618.2	6.0	2	1	3									Medium Stiff, Red-Brown, Silty CLAY (A-7-5)	
	615.7	8.5	2	3	4									617.2	7.0
615														RESIDUAL	
	610.7	13.5	3	5	5									Soft to Medium Stiff, Tan-Brown, Silty CLAY (A-7-5)	
	605.7	18.5	3	5	6									612.2	12.0
610														Loose to Medium Dense, Brown-White-Orange, Silty Fine to Coarse SAND (A-2-4)	
	600.7	23.5	2	4	7										
	595.7	28.5	5	6	10										
595														594.2	30.0
														Boring Terminated at Elevation 594.2 ft In Residual Silty Fine to Coarse SAND (A-2-4)	

NCDOT BORE DOUBLE B-5857 U-6146 GEO RDY BORINGS.GPJ NC_DOT.GDT 1/7/20

PROJECT: 48392

REFERENCE: U-6146

CONTENTS

<u>SHEET NO.</u>	<u>DESCRIPTION</u>
1	TITLE SHEET
2	LEGEND (SOIL & ROCK)
3	SITE PLAN AND WALL ENVELOPE
4-5	BORE LOGS

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

STRUCTURE
SUBSURFACE INVESTIGATION

COUNTY GASTON

PROJECT DESCRIPTION US 29/US74 (WILKINSON BLVD)
FROM SR 2209 (WESLEYAN DRIVE/MARKET ST)
TO SR 2016/SR 2017 (GEORGIA BELLE AVE/HUBBARD
ST) AND BRIDGE #350082 OVER SOUTH FORK
CATAWBA RIVER

SITE DESCRIPTION RETAINING WALL NO. 6:
PRECAST GRAVITY RETAINING WALL FROM -YI-
13+44 LT TO -L- 54+70, LT

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	U-6146	1	5

CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF STUDY, PLANNING AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. THE VARIOUS FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N.C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT, AT (919) 707-6850. THE SUBSURFACE PLANS AND REPORTS, FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA ARE NOT PART OF THE CONTRACT.

GENERAL SOIL AND ROCK STRATA DESCRIPTIONS AND INDICATED BOUNDARIES ARE BASED ON A GEOTECHNICAL INTERPRETATION OF ALL AVAILABLE SUBSURFACE DATA AND MAY NOT NECESSARILY REFLECT THE ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS OR BETWEEN SAMPLED STRATA WITHIN THE BOREHOLE. THE LABORATORY SAMPLE DATA AND THE IN SITU (IN-PLACE) TEST DATA CAN BE RELIED ON ONLY TO THE DEGREE OF RELIABILITY INHERENT IN THE STANDARD TEST METHOD. THE OBSERVED WATER LEVELS OR SOIL MOISTURE CONDITIONS INDICATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOIL MOISTURE CONDITIONS MAY VARY CONSIDERABLY WITH TIME ACCORDING TO CLIMATIC CONDITIONS INCLUDING TEMPERATURES, PRECIPITATION AND WIND, AS WELL AS OTHER NON-CLIMATIC FACTORS.

THE BIDDER OR CONTRACTOR IS CAUTIONED THAT DETAILS SHOWN ON THE SUBSURFACE PLANS ARE PRELIMINARY ONLY AND IN MANY CASES THE FINAL DESIGN DETAILS ARE DIFFERENT. FOR BIDDING AND CONSTRUCTION PURPOSES, REFER TO THE CONSTRUCTION PLANS AND DOCUMENTS FOR FINAL DESIGN INFORMATION ON THIS PROJECT. THE DEPARTMENT DOES NOT WARRANT OR GUARANTEE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION MADE, NOR THE INTERPRETATIONS MADE, OR OPINION OF THE DEPARTMENT AS TO THE TYPE OF MATERIALS AND CONDITIONS TO BE ENCOUNTERED. THE BIDDER OR CONTRACTOR IS CAUTIONED TO MAKE SUCH INDEPENDENT SUBSURFACE INVESTIGATIONS AS HE DEEMS NECESSARY TO SATISFY HIMSELF AS TO CONDITIONS TO BE ENCOUNTERED ON THE PROJECT. THE CONTRACTOR SHALL HAVE NO CLAIM FOR ADDITIONAL COMPENSATION OR FOR AN EXTENSION OF TIME FOR ANY REASON RESULTING FROM THE ACTUAL CONDITIONS ENCOUNTERED AT THE SITE DIFFERING FROM THOSE INDICATED IN THE SUBSURFACE INFORMATION.

- NOTES:
- THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N.C. DEPARTMENT OF TRANSPORTATION AS ACCURATE NOR IS IT CONSIDERED PART OF THE PLANS, SPECIFICATIONS OR CONTRACT FOR THE PROJECT.
 - BY HAVING REQUESTED THIS INFORMATION, THE CONTRACTOR SPECIFICALLY WAIVES ANY CLAIMS FOR INCREASED COMPENSATION OR EXTENSION OF TIME BASED ON DIFFERENCES BETWEEN THE CONDITIONS INDICATED HEREIN AND THE ACTUAL CONDITIONS AT THE PROJECT SITE.

PERSONNEL
<u>M. BREWER</u>
<u>C. ODOM</u>
<u>D. UNDERWOOD</u>
<u>ITHIR TESTING</u>

INVESTIGATED BY CG2

DRAWN BY M. BREWER, P.E.

CHECKED BY R. KRAL, P.E.

SUBMITTED BY M. BREWER, P.E.

DATE JANUARY 2020

Prepared in the Office of:



CAROLINAS
GEOTECHNICAL
GROUP

2400 CROWNPOINT EXECUTIVE DRIVE
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CHARLOTTE, NC 28227
(980) 339-8684



SIGNATURE	DATE
DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED	

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS

GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION

SOIL IS CONSIDERED UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO THE STANDARD PENETRATION TEST (AASHTO T 206, ASTM D1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. FOR EXAMPLE, *VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6*

SOIL LEGEND AND AASHTO CLASSIFICATION

GENERAL CLASS.	GRANULAR MATERIALS (≤ 35% PASSING #200)				SILT-CLAY MATERIALS (> 35% PASSING #200)				ORGANIC MATERIALS				
GROUP CLASS.	A-1	A-3	A-2		A-4	A-5	A-6	A-7	A-1, A-2	A-4, A-5	A-6, A-7		
SYMBOL													
% PASSING #10 #40 #200													
MATERIAL PASSING #40 LL PI	-		-										
GROUP INDEX	0		0		4 MX		8 MX		12 MX		16 MX		
USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS, GRAVEL, AND SAND		FINE SAND		SILTY OR CLAYEY GRAVEL AND SAND		SILTY SOILS		CLAYEY SOILS		SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER		
GEN. RATING AS SUBGRADE	EXCELLENT TO GOOD						FAIR TO POOR				FAIR TO POOR	POOR	UNSATISFACTORY

PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS ≥ LL - 30

COMPACTNESS OR CONSISTENCY

PRIMARY SOIL TYPE	COMPACTNESS OR CONSISTENCY	RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE)	RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT ²)
GENERALLY GRANULAR MATERIAL (NON-COHESIVE)	VERY LOOSE LOOSE MEDIUM DENSE DENSE VERY DENSE	< 4 4 TO 10 10 TO 30 30 TO 50 > 50	N/A
GENERALLY SILT-CLAY MATERIAL (COHESIVE)	VERY SOFT SOFT MEDIUM STIFF STIFF VERY STIFF HARD	< 2 2 TO 4 4 TO 8 8 TO 15 15 TO 30 > 30	< 0.25 0.25 TO 0.5 0.5 TO 1.0 1 TO 2 2 TO 4 > 4

TEXTURE OR GRAIN SIZE

U.S. STD. SIEVE SIZE OPENING (MM)	4	10	40	60	200	270
	4.76	2.00	0.42	0.25	0.075	0.053

BOULDER (BLDR.)	COBBLE (COB.)	GRAVEL (GR.)	COARSE SAND (CSE. SD.)	FINE SAND (F SD.)	SILT (SL.)	CLAY (CL.)

GRAIN SIZE

MM	305	75	2.0	0.25	0.05	0.005
IN.	12	3				

SOIL MOISTURE - CORRELATION OF TERMS

SOIL MOISTURE SCALE (ATTERBERG LIMITS)	FIELD MOISTURE DESCRIPTION	GUIDE FOR FIELD MOISTURE DESCRIPTION	
LL PLASTIC RANGE (PI) PL	LIQUID LIMIT	- SATURATED - (SAT.)	USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE
	PLASTIC LIMIT	- WET - (W)	SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE
	OPTIMUM MOISTURE SHRINKAGE LIMIT	- MOIST - (M)	SOLID; AT OR NEAR OPTIMUM MOISTURE
		- DRY - (D)	REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE

PLASTICITY

	PLASTICITY INDEX (PI)	DRY STRENGTH
NON PLASTIC	0-5	VERY LOW
SLIGHTLY PLASTIC	6-15	SLIGHT
MODERATELY PLASTIC	16-25	MEDIUM
HIGHLY PLASTIC	26 OR MORE	HIGH

COLOR

DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY). MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.

GRADATION

WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE. UNIFORMLY GRADED - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES OF TWO OR MORE SIZES.

ANGULARITY OF GRAINS

THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.

MINERALOGICAL COMPOSITION

MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.

COMPRESSIBILITY

SLIGHTLY COMPRESSIBLE	LL < 31
MODERATELY COMPRESSIBLE	LL = 31 - 50
HIGHLY COMPRESSIBLE	LL > 50

PERCENTAGE OF MATERIAL

ORGANIC MATERIAL	GRANULAR SOILS	SILT - CLAY SOILS	OTHER MATERIAL
TRACE OF ORGANIC MATTER	2 - 3%	3 - 5%	TRACE
LITTLE ORGANIC MATTER	3 - 5%	5 - 12%	LITTLE
MODERATELY ORGANIC	5 - 10%	12 - 20%	SOME
HIGHLY ORGANIC	> 10%	> 20%	HIGHLY

GROUND WATER

WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING

STATIC WATER LEVEL AFTER 24 HOURS

PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA

SPRING OR SEEP

MISCELLANEOUS SYMBOLS

ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION

SOIL SYMBOL

ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT

INFERRED SOIL BOUNDARY

INFERRED ROCK LINE

ALLUVIAL SOIL BOUNDARY

DIP & DIP DIRECTION OF ROCK STRUCTURES

TEST BORING

AUGER BORING

CORE BORING

MONITORING WELL

PIEZOMETER INSTALLATION

SLOPE INDICATOR INSTALLATION

CONE PENETROMETER TEST

SOUNDING ROD

TEST BORING WITH CORE

SPT N-VALUE

RECOMMENDATION SYMBOLS

UNDERCUT

SHALLOW UNDERCUT

UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE

UNCLASSIFIED EXCAVATION - ACCEPTABLE DEGRADABLE ROCK

UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE USED IN THE TOP 3 FEET OF EMBANKMENT OR BACKFILL

ABBREVIATIONS

AR - AUGER REFUSAL
BT - BORING TERMINATED
CL - CLAY
CPT - CONE PENETRATION TEST
CSE. - COARSE
DMT - DILATOMETER TEST
DPT - DYNAMIC PENETRATION TEST
e - VOID RATIO
f - FINE
FOSS. - FOSSILIFEROUS
FRAC. - FRACTURED, FRACTURES
FRAGS. - FRAGMENTS
HL - HIGHLY

MED. - MEDIUM
MICA. - MICACEOUS
MOD. - MODERATELY
NP - NON PLASTIC
ORG. - ORGANIC
PMT - PRESSUREMETER TEST
SAP. - SAPROLITIC
SD. - SAND, SANDY
SL. - SILT, SILTY
SLI. - SLIGHTLY
TCR - TRICONE REFUSAL
w - MOISTURE CONTENT
V - VERY

VST - VANE SHEAR TEST
WEA. - WEATHERED
γ - UNIT WEIGHT
γ_d - DRY UNIT WEIGHT

SAMPLE ABBREVIATIONS

S - BULK
SS - SPLIT SPOON
ST - SHELBY TUBE
RS - ROCK
RT - RECOMPACTED TRIAXIAL
CBR - CALIFORNIA BEARING RATIO

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:

☐ CME-45C

☐ CME-55

☒ CME-550

☐ VANE SHEAR TEST

ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT REFUSAL IF TESTED. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS IN NON-COASTAL PLAIN MATERIAL. THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK. ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:

WEATHERED ROCK (WR)

NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.

CRYSTALLINE ROCK (CR)

FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.

NON-CRYSTALLINE ROCK (NCR)

FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.

COASTAL PLAIN SEDIMENTARY ROCK (CP)

COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.

WEATHERING

FRESH

ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE.

VERY SLIGHT (V SLI.)

ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN. CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE.

SLIGHT (SLI.)

ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.

MODERATE (MOD.)

SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK.

MODERATELY SEVERE (MOD. SEV.)

ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. *IF TESTED, WOULD YIELD SPT REFUSAL*

SEVERE (SEV.)

ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. *IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF*

VERY SEVERE (V SEV.)

ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. *IF TESTED, WOULD YIELD SPT N VALUES < 100 BPF*

COMPLETE

ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.

ROCK HARDNESS

VERY HARD

CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.

HARD

CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.

MODERATELY HARD

CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.

MEDIUM HARD

CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.

SOFT

CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.

VERY SOFT

CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGER NAIL.

FRACTURE SPACING

TERM

VERY WIDE

SPACING

MORE THAN 10 FEET

WIDE

3 TO 10 FEET

MODERATELY CLOSE

1 TO 3 FEET

CLOSE

0.16 TO 1 FOOT

VERY CLOSE

LESS THAN 0.16 FEET

BEDDING

TERM

VERY THICKLY BEDDED

THICKNESS

4 FEET

THICKLY BEDDED

1.5 - 4 FEET

THINLY BEDDED

0.16 - 1.5 FEET

VERY THINLY BEDDED

0.03 - 0.16 FEET

THICKLY LAMINATED

0.008 - 0.03 FEET

THINLY LAMINATED

< 0.008 FEET

INDURATION

FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.

FRIABLE

RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.

MODERATELY INDURATED

GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.

INDURATED

GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.

EXTREMELY INDURATED

SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.

TERMS AND DEFINITIONS

ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.

AQUIFER - A WATER BEARING FORMATION OR STRATA.

ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.

ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, SUCH AS SHALE, SLATE, ETC.

ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE.

CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.

COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.

CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.

DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.

DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.

DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.

FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.

FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.

FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL.

FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.

FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.

JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.

LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.

LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.

MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.

PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.

RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.

ROCK QUALITY DESIGNATION (RQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.

SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.

SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.

SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.

STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS IN OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.

STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.

STRATA ROCK QUALITY DESIGNATION (SRQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.

TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.

BENCH MARK:

ELEVATION:

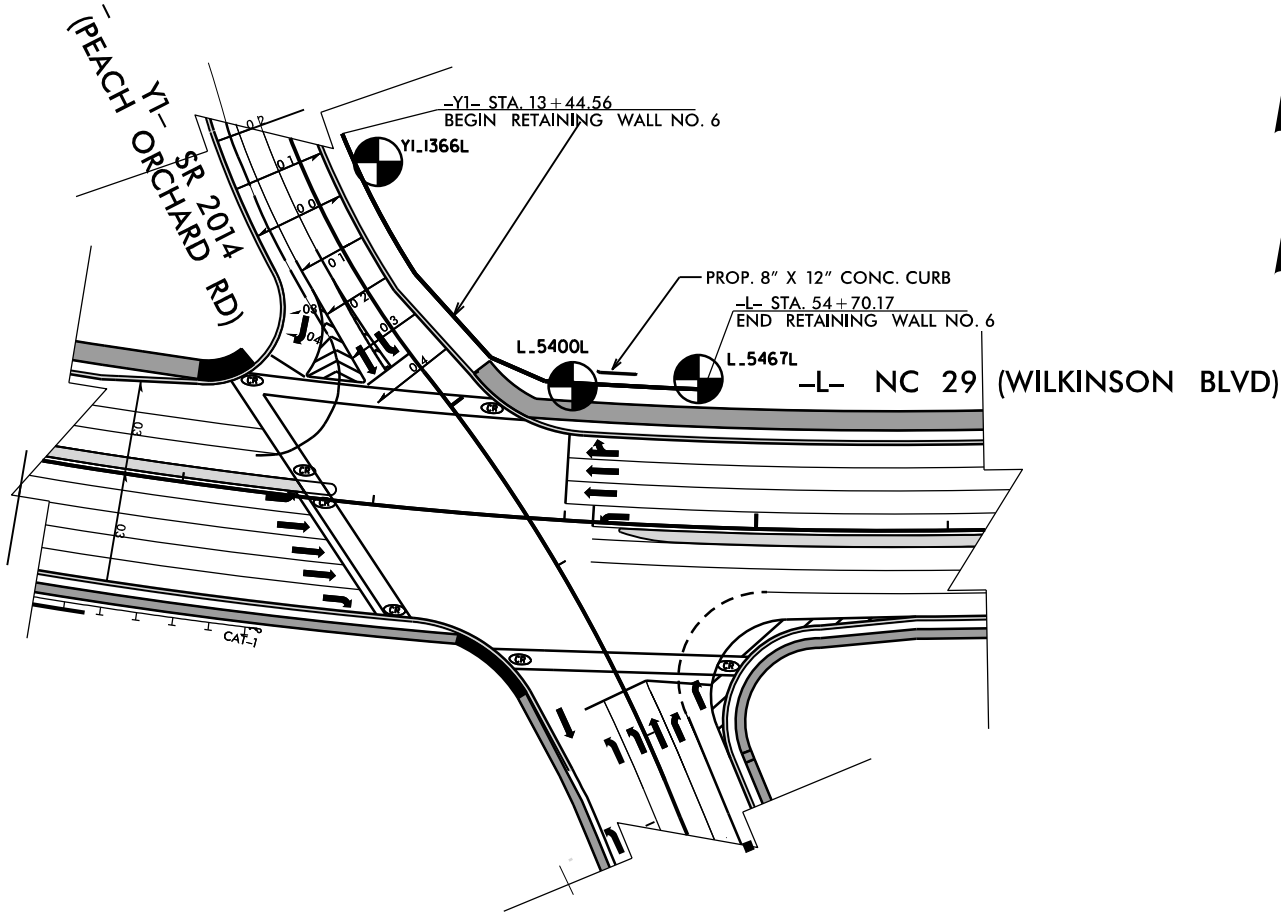
FEET

NOTES:

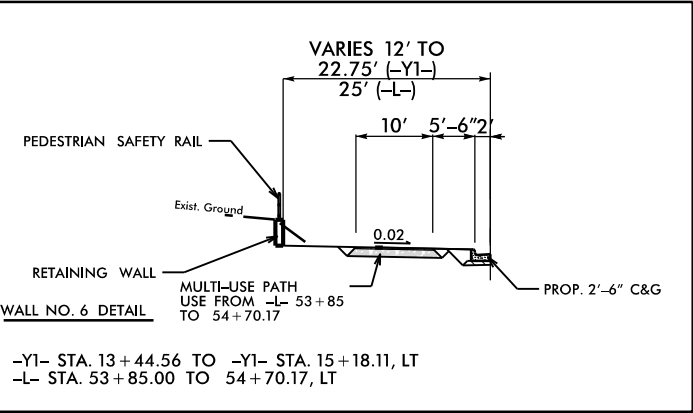
SURVEY AND ROADWAY DESIGN FILES PROVIDED BY TGS ENGINEERS ON 12/05/2019

DATE: 8-15-11

RETAINING WALL NO. 6:

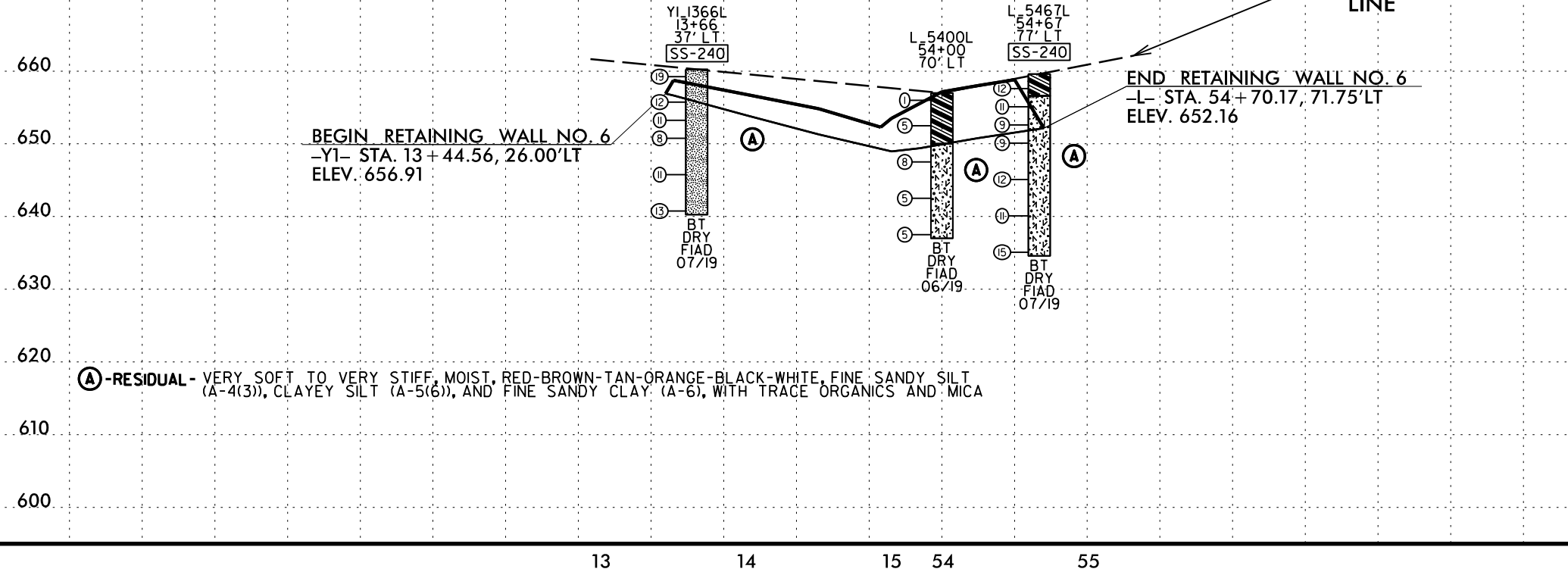


THE WALL ENVELOPE DOES NOT ACCURATELY
DEPICT THE ACTUAL FACE OF THE WALL
AT THE FOLLOWING LOCATION:
-Y1- STA. 14+00.00 TO 15+18.11, LT



SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	200		
SS-240	37' LT	13+66 -Y1-	6.0 - 7.5'	A-4(3)	39	0	1.8	18.8	61.0	18.4	99.0	98.0	85.7	26.0	-
SS-113	77' LT	54+67 -L-	8.5 - 10.0'	A-5(6)	52	0	3.5	15.9	64.2	16.4	98.0	96.0	82.6	39.2	-



GEOTECHNICAL BORING REPORT

BORE LOG

WBS 48392.1.1		TIP U-6146		COUNTY GASTON		GEOLOGIST C. Keeten								
SITE DESCRIPTION Retaining Wall No. 6 on -Y1-and -L- from -Y1- 13+44 LT to -L- 54+70 LT							GROUND WTR (ft)							
BORING NO. Y1_1366L		STATION 13+67		OFFSET 37 ft LT		ALIGNMENT -Y1-		0 HR. Dry						
COLLAR ELEV. 660.1 ft		TOTAL DEPTH 20.0 ft		NORTHING 553,067		EASTING 1,379,460		24 HR. FIAD						
DRILL RIG/HAMMER EFF./DATE CG20446 Diedrich D50 89%05/22/2019				DRILL METHOD H.S. Augers			HAMMER TYPE Automatic							
DRILLER C. Keeten			START DATE 07/26/19		COMP. DATE 07/26/19		SURFACE WATER DEPTH N/A							
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT				SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				ELEV. (ft) DEPTH (ft)
665														
660	660.1	0.0												660.1 GROUND SURFACE 0.0
655	656.6	3.5	7	8	11						M		RESIDUAL Medium Stiff to Very Stiff, Red-Tan-Orange, Fine Sandy SILT (A-4(3)), with trace mica	
	654.1	6.0	3	4	8						M			
	651.6	8.5	3	4	7					SS-240	26%			
650	651.6	8.5	3	3	5						M			
	646.6	13.5	4	4	7						M			
645	641.6	18.5	3	5	8						M		640.1 Boring Terminated at Elevation 640.1 ft In Residual Fine Sandy SILT (A-4) 20.0	

WBS 48392.1.1				TIP U-6146				COUNTY GASTON				GEOLOGIST C. Keeten					
SITE DESCRIPTION Retaining Wall No. 6 on -Y1-and -L- from -Y1- 13+44 LT to -L- 54+70 LT												GROUND WTR (ft)					
BORING NO. L_5400L				STATION 54+00				OFFSET 70 ft LT				ALIGNMENT -L-				0 HR. Dry	
COLLAR ELEV. 657.0 ft				TOTAL DEPTH 20.0 ft				NORTHING 551,554				EASTING 1,383,185				24 HR. FIAD	
DRILL RIG/HAMMER EFF./DATE CG29473 CME-550 88%10/25/2018								DRILL METHOD H.S. Augers				HAMMER TYPE Automatic					
DRILLER J. Estep				START DATE 06/26/19				COMP. DATE 06/26/19				SURFACE WATER DEPTH N/A					
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION			
			0.5ft	0.5ft	0.5ft	0	25	50	75	100							
660																	
	657.0	0.0													657.0 GROUND SURFACE 0.0		
655			WOH	WOH	1	1	-	-	-	-		M			RESIDUAL Very Soft to Medium Stiff, Red-Brown, Fine Sandy CLAY (A-6), with trace organics and mica 650.0 Medium Stiff, Red-Brown-Black-White, Clayey SILT (A-5), with trace mica 7.0 637.0 Boring Terminated at Elevation 637.0 ft In Residual Clayey SILT (A-5) 20.0		
	653.5	3.5	WOH	2	3	5	-	-	-	-		M					
650												M					
	648.5	8.5	2	3	5							M					
645												M					
	643.5	13.5	1	2	3							M					
640																	
	638.5	18.5	2	2	3							M					

GEOTECHNICAL BORING REPORT
BORE LOG

WBS 48392.1.1			TIP U-6146			COUNTY GASTON			GEOLOGIST C. Keeten						
SITE DESCRIPTION Retaining Wall No. 6 on -Y1-and -L- from -Y1- 13+44 LT to -L- 54+70 LT									GROUND WTR (ft)						
BORING NO. L_5467L			STATION 54+67			OFFSET 77 ft LT			ALIGNMENT -L-						
COLLAR ELEV. 659.6 ft			TOTAL DEPTH 25.0 ft			NORTHING 551,558			EASTING 1,383,250						
DRILL RIG/HAMMER EFF./DATE CG20446 Diedrich D50 89%05/22/2019						DRILL METHOD H.S. Augers			HAMMER TYPE Automatic						
DRILLER C. Odom			START DATE 07/16/19			COMP. DATE 07/16/19			SURFACE WATER DEPTH N/A						
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	L O G	SOIL AND ROCK DESCRIPTION	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				ELEV. (ft)	DEPTH (ft)
660														659.6	0.0
655	658.6	1.0	3	5	7	12					M		RESIDUAL Stiff, Red-Brown, Fine Sandy CLAY (A-6), with trace organics and mica	656.6	3.0
	656.1	3.5	4	5	6	11								M	Stiff, Red-Brown, Clayey SILT (A-5(6)), with trace mica
	653.6	6.0	3	4	5	9								M	
650	651.1	8.5	3	4	5	9					SS-113	39%			
645	646.1	13.5	4	5	7	12					M				
640	641.1	18.5	4	4	7	11									
635	636.1	23.5	5	6	9	15					M			634.6	25.0

NCDOT BORE DOUBLE B-5857_U-6146_GEO_RDY_BORINGS.GPJ NC_DOT.GDT 1/15/20